



# Weather MicroServer™

## User Manual



# **Weather MicroServer™**

## **User Manual**

Version 3.21

All specifications subject to change without notice.

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# Welcome!

Welcome to the Columbia Weather Systems family of users and congratulations on your purchase of the Weather MicroServer.

**Please read this manual completely prior to installation.**





# Important Notice: Shipping Damage

**BEFORE YOU READ ANY FURTHER, please inspect all system components for obvious shipping damage.** The Weather MicroServer is a small board computer and can be damaged by rough handling. Your unit was packaged to minimize the possibility of damage in transit. Therefore, we recommend that you save the shipping container for any future shipment of your unit.

In the event your order arrives in damaged condition, it is important that the following steps be taken immediately. The title transfers automatically to you, the customer, once the material is entrusted to the transport company.

**NOTE:** DO NOT RETURN THE INSTRUMENT TO COLUMBIA WEATHER SYSTEMS until the following steps are completed. Failure to follow this request will jeopardize your claim.

1. Open the container and inspect the contents. Do not throw away the container or any damaged parts. Try to keep items in the same condition as originally received.
2. Notify the transport company immediately in writing, preferably by facsimile, about the shipping damage.
3. Wait for the transport company's representative to inspect the shipment personally.
4. After inspection, request permission from Columbia Weather Systems for return of the damaged instrument by calling the Service Department, (503) 629-0887.
5. Return approved items to us at the following address:

**Columbia Weather Systems, Inc.**

**5285 NE Elam Young Parkway, Suite C100**

**Hillsboro, OR 97124**

6. After return authorization is issued and we receive the instrument, an estimate of the cost of repair will be sent to you for submittal to the transport company as a claim.

## ESD Protection

Electrostatic Discharge (ESD) can cause immediate or latent damage to electronic circuits. The Weather MicroServer is adequately protected against ESD for their intended use. However, it is possible to damage the product by delivering electrostatic discharges when touching, removing, or inserting any objects inside the equipment housing.

To make sure you are not delivering high static voltages yourself:

1. Handle ESD sensitive components on a properly grounded and protected ESD workbench. When this is not possible, ground yourself with a wrist strap and a resistive connection cord to the equipment chassis before touching the boards. When neither of the above is possible, at least touch a conductive part of the equipment chassis with your other hand before touching the boards.
2. Always hold the boards by the edges and avoid touching the component contacts.

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# SECTION 1: INTRODUCTION

## The Weather MicroServer



The Weather MicroServer is a self-contained, proprietary system utilizing the Linux operating system. The MicroServer employs a web browser user interface which allows the operator to monitor weather data in real-time, log data as it is received and configure station functionality.

The device easily connects to an existing network with an included Ethernet cable. Two serial ports offer interface to the Weather Display Console as well as additional peripheral devices or sensors. The main serial port (COM1) interfaces with all of our available weather stations.

The Weather MicroServer can provide real-time weather data to WeatherMaster Software and the Weather Display Console over the network. This allows users to simultaneously monitor the weather using any computer connected to the network.

Once configured the Weather MicroServer automatically provides FTP output, XML web service. FTP output includes XML, CSV, and CSV append formats.

SNMP, Modbus/TCP, and Modbus/RTU communication protocols are standard for Industrial Management applications.

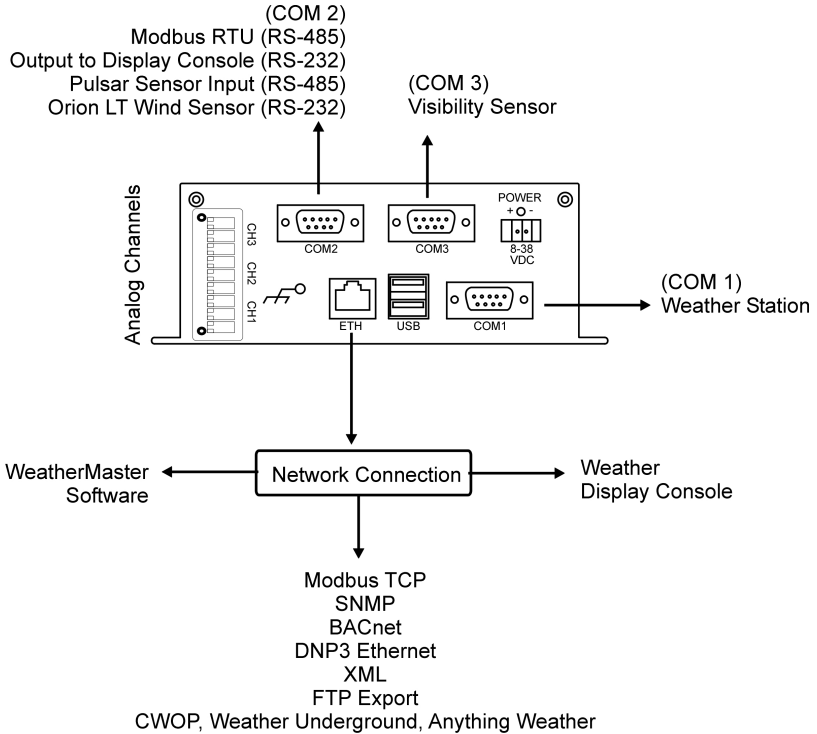
The Weather MicroServer includes automatic data output to Weather Underground, Anything Weather and the Citizen Weather Observer Program (CWOP).

The MicroServer stores all parameters on a 1-minute interval in daily data log files.



The Weather MicroServer interfaces with any Capricorn, Pegasus, Magellan, Vela, Orion, or Pulsar weather station to provide a range of weather parameters and monitoring options.

## MicroServer System Diagram



Two models of the MicroServer are available for a variety of applications.

The standard MicroServer has two analog channels available for additional sensors and one digital channel available for the Tipping Bucket Rain Gauge.

The 8-Channel MicroServer has eight analog channels available for additional sensors. For more information see the 8-Channel MicroServer section.

Both MicroServer models have the same functionality as outlined in the diagram above.

---

# Measurements and Calculations

## Wind Speed and Direction Parameters

(The MicroServer can accept two wind sensors)

- Wind Speed
- Raw Wind Direction
- Adjusted Wind Direction
- 3 Second Rolling Average Wind Speed
- 3 Second Rolling Average Wind Direction
- 2 Minute Rolling Average Wind Speed
- 2 Minute Rolling Average Wind Direction
- 10 Minute Rolling Average Wind Speed
- 10 Minute Rolling Average Wind Direction
- 10 Minute Gust Wind Direction
- 10 Minute Gust Wind Speed
- 10 Minute Gust Time
- 60 Minute Gust Wind Direction
- 60 Minute Gust Wind Speed
- 60 Minute Gust Time
- 60 Minute Rolling Average Wind Speed
- 60 Minute Rolling Average Wind Direction
- 2 Minute Gust Wind Direction
- 2 Minute Gust Wind Speed
- 2 Minute Gust Time

## Precipitation Parameters

- Rain Today
- Rain this week
- Rain this month
- Rain this year
- Rain Rate
- Rain Last Hour
- Hail Today\*
- Hail Rate\*
- Precipitation Type\*\*\*

## Relative Humidity Parameter

- Relative Humidity

## Solar Radiation Parameter

- Solar Radiation

## Temperature Parameters

- Temperature 1
- Temperature 2\*\*
- Temperature 3\*\*
- Temperature 4\*\*
- Average Temperature Today
- Degree Days

## Barometric Pressure Parameters

- Raw Barometric Pressure
- Adjusted Barometric Pressure
- Pressure Tendency

## Calculated Parameters

- Wind Chill
- Heat Index
- Dew Point
- Density Altitude
- Wet Bulb Temperature

## Air Quality Parameters

- Wet Bulb Globe Temperature
- Wet Bulb Temperature
- Saturated Vapor Pressure
- Vapor Pressure
- Dry Air Pressure
- Dry Air Density
- Wet Air Density
- Absolute Humidity
- Air Density Ratio
- Adjusted Altitude
- SAE Correction Factor

## Visibility

- Visibility
- Lux
- Extinction Coefficient

## Specifications

- 600 MHz ARM Processor
- 128 MB DDR3 SDRAM
- 128 MB NAND Flash Memory
- 3 Serial Communication Ports (RS-232)
- RS-485 capable on COM2
- 1 Ethernet Port
- Micro SD Card
- USB Port
- Linux Operating System
- Indoor Enclosure Dimensions: 6.40" W x 2.60" H x 5.40" D
- Operating temperature : -40° to +85°C
- Power 8 to 38 VDC (80mA at 12VDC)

\* Available with Orion Weather Stations only

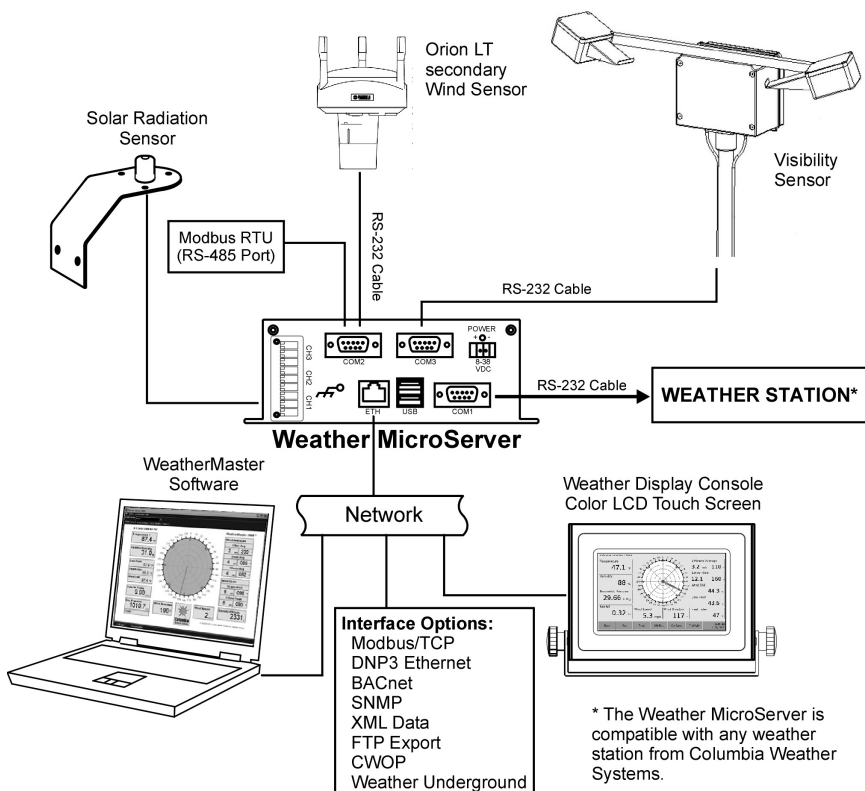
\*\* Available with Capricorn/Pegasus and Capricorn FLX Weather Stations and MicroServer Analog Channels

\*\*\* Available with Pulsar 600 Weather Stations only



## SECTION 2: SYSTEM CONFIGURATION

The Weather MicroServer is designed to receive weather data input from any Orion, Magellan, Capricorn, Pegasus, Pulsar, or Vela weather station.



### Orion Weather Station Interface

The Orion Weather Station connects to COM1 of the MicroServer using an RS-232 cable or a wireless link.

For a direct cabled connection, COM1 of the MicroServer connects to the Interface Module using an RS-232 cable provided with the station.

For a wireless connection, COM1 of the MicroServer connects to the wireless transceiver using an RS-232 cable provided with the transceiver.

In the user interface, Data Inputs page, select “Orion” from the Station Type drop-down menu.

## **Magellan & Vela Weather Station Interface**

The Magellan and Vela Weather Stations connect to COM1 of the MicroServer using an RS-232 cable or a wireless link.

For a direct cabled connection, COM1 of the MicroServer connects to the Interface Module using an RS-232 cable provided with the station.

For a wireless connection, COM1 of the MicroServer connects to the client wireless transceiver using an RS-232 cable provided with the transceiver.

In the user interface, Data Inputs page, select “Magellan” or “Vela” appropriately from the Station Type drop-down menu.

## **Capricorn 2000EX Weather Station Interface**

The Capricorn 2000EX Weather Station connects to COM1 of the MicroServer using an RS-232 cable or a wireless link.

For a direct cabled connection, COM1 of the MicroServer connects to the “Modem Serial” port on the Capricorn Control Module using an RS-232 cable provided with the station.

For a wireless connection, COM1 of the MicroServer connects to the client wireless transceiver using an RS-232 cable provided with the transceiver.

In the user interface, Data Inputs page, select “Capricorn” from the Station Type drop-down menu.

## **Capricorn FLX Weather Station Interface**

The Capricorn FLX Weather Station connects to COM1 of the MicroServer using an RS-232 cable or a wireless link.

For a direct cabled connection, COM1 of the MicroServer connects to the Capricorn FLX Control Module using an RS-232 cable provided with the station.

For a wireless connection, COM1 of the MicroServer connects to the client wireless transceiver using an RS-232 cable provided with the transceiver.

In the user interface, Data Inputs page, select “Capricorn FLX” from the Station Type drop-down menu.

## **Pegasus Weather Stations Interface**

The Pegasus Weather Station connects to COM1 of the MicroServer with a wireless link.

COM1 of the MicroServer connects to the client wireless transceiver using an RS-232 cable provided with the transceiver.

In the user interface, Data Inputs page, select “Capricorn” from the Station Type drop-down menu.

## **Pegasus FLX Weather Station Interface**

The Pegasus FLX Weather Station connects to COM1 of the MicroServer with a wireless link.

COM1 of the MicroServer connects to the client wireless transceiver using an RS-232 cable provided with the transceiver.

In the user interface, Data Inputs page, select “Capricorn FLX” from the Station Type drop-down menu.

## **Orion LT Interface**

The Orion LT Wind Monitor connects to COM1 of the MicroServer using an RS-232 cable or a wireless link.

For a direct cabled connection, COM1 of the MicroServer connects to the Interface Module using an RS-232 cable provided with the station.

For a wireless connection, COM1 of the MicroServer connects to the client wireless transceiver using an RS-232 cable provided with the transceiver.

In the user interface, Data Inputs page, select “Orion” under COM1 from the Station Type drop-down menu.

An Orion LT can also be connected to COM2 as a secondary wind sensor. The wind speed and direction parameters will be displayed with the number “2” after each parameter.

To interface a second wind sensor, select “Input from Orion LT sensor” from the COM2 drop-down menu.

## **Pulsar Weather Station Interface**

The Pulsar Weather Station can communicate with the MicroServer using RS-232 on COM 1 or RS-485 on COM 2.

### **Input to COM 1:**

To connect the Pulsar Weather Station to COM 1 of the MicroServer a RS-485 to RS-232 converter is required.



In the user interface, Data Inputs page, select “Pulsar (RS232)” from the Station Type drop-down menu.

## Input to COM 2:

For a direct RS-485 cabled connection, COM2 of the MicroServer connects directly to the Pulsar sensor or through the Interface Module using an RJ-11 cable provided with the station.

In the user interface, Data Inputs page, select “Pulsar (RS485)” from the Station Type drop-down menu.

## Magnetic Declination Setting for Pulsar Sensor

The screenshot shows the Columbia Weather Systems user interface. On the left is a navigation menu with options: Home, Realtime Display, Latest Measurements, Change Station Name, Network Setup, Change Password, Date and Time, Data Inputs (selected), Data Outputs, Data Logs, Configuration File, Measurements, Units, and Parameter Settings. The main area is titled 'Data Inputs' and contains settings for COM1, COM2, COM3, and Analog Channels. COM2 is set to 'RS485 Input from Pulsar sensor'. A 'Pulsar Settings' button is visible. An 'Edit pulsar settings' dialog box is open, showing 'Magnetic Declination' set to '16.030' and 'Enable Compass Correction' checked. The dialog has 'Update Pulsar' and 'Cancel' buttons. At the bottom of the main interface, there are 'Apply Changes' and 'Cancel Changes' buttons, and a copyright notice: '©Copyright 2013 All rights reserved, Columbia Weather Systems, Inc.'

The Pulsar Weather Station is equipped with an integrated electronic compass that will automatically correct the wind direction if the station is moved from its original location.

To enable the compass correction feature choose the Data Inputs menu item then click the Pulsar Settings button. Enable Compass Correction, enter the Magnetic Declination\* in **decimal format** then click the Update Pulsar button.

\*To determine the magnetic declination for the station location visit:

<http://www.ngdc.noaa.gov/geomag-web/#declination>

## COM 2 Interface

COM 2 on the MicroServer can be used for the following purposes:

**Modbus RTU Communication:**

Modbus RTU is available on COM2 through RS-485 communication on pins 1 (TX+), 6 (TX-), and 5 (GND).

**Orion LT:**

A secondary Orion LT wind sensor can be connected to COM2. This connection is RS-232.

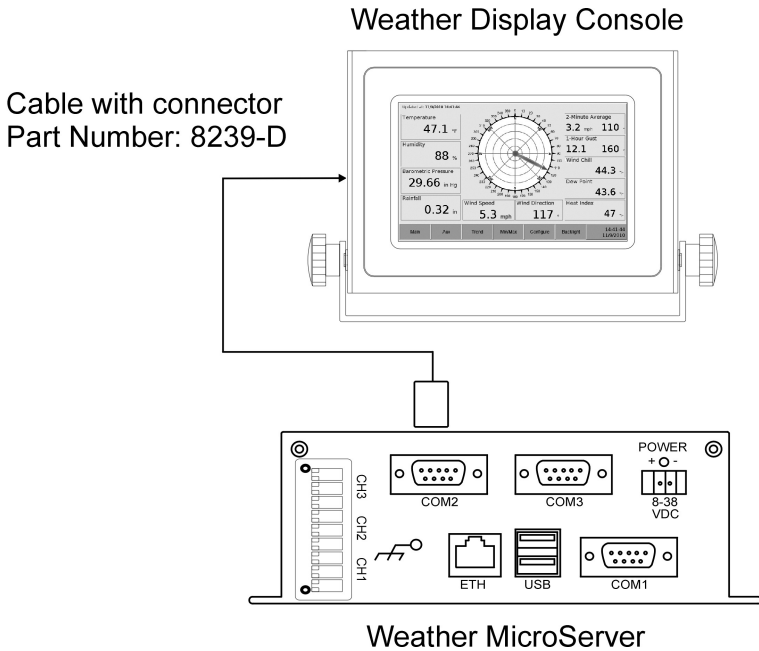
**Pulsar Weather Station:**

A Pulsar weather station can be connected to COM2. This connection is RS-485.

**Output Serial Data (Adjusted COM1 Data):**

COM 2 can be configured to output the sensor data from COM 1 for other serial devices such as a Display Console.

Note: In order for the Display Console to receive data from COM 2 of the MicroServer the proper DB-9 connector and RJ-11 cable are required. Please contact Columbia Weather Systems to order the correct parts.



## PTB330 Pressure Sensor:

The PTB330 Pressure Sensor can be connected to COM2. This connection is RS-232.

In the user interface, Data Inputs page, select “Input from PTB330 Pressure Sensor” from the COM2 drop-down menu.

Click on PTB330 Settings and enter in the Altitude, Reference Elevation and QFE Temperature. Click Update PTB330 Sensor to save the settings to the device.

The screenshot shows the Columbia Weather Systems web interface. On the left is a navigation menu with options: Home, Realtime Display, Change Station Name, Network Setup, Change Password, Date and Time, Data Inputs (selected), Data Outputs, Data Logs, Configuration File, Measurements, Units, and Parameter Settings. The main content area is titled 'Data Inputs' and includes sections for 'Capricorn FLX Sensors' and 'Additional Onboard Sensors'. The 'COM2' dropdown menu is set to 'Input from PTB330 Pressure Sensor', and a 'PTB330 Settings' button is visible. An 'Edit PTB330 sensor settings' dialog box is open, showing input fields for 'Altitude (m)' (20), 'Reference Elevation (m)' (100), and 'QFE Temperature (°C)' (20). At the bottom of the dialog are 'Update Ptb330 Sensor' and 'Cancel' buttons.

## COM 3 Interface

COM 3 on the MicroServer can be used for the following purposes:

### Visibility Sensor Interface

Two types of visibility sensors can be connected to COM3 to provide visibility data. Our standard visibility sensor (SVS1) and a low power visibility sensor (CS120A).

The MicroServer will display three parameters for the standard visibility sensor: visibility, extinction coefficient, and lux (if a photo sensor is included).

---

## Particle Concentration Interface

A particulate/dust monitor can be connected to COM3 to provide particle concentration data. The MicroServer will display the particle concentration data in mg per cubic meter in the Latest Measurements page.

## Standard Analog/Digital Channels

The standard MicroServer has two analog channels (CH1 & 2) and one digital channel (CH3).

The digital channel (CH3) is configured to accept a tipping bucket rain gauge.

The analog channels can be configured to accept our standard sensors as follows:

Temperature (AD36). This is our standard air, soil/water, or PV panel temperature sensor.

Amplified Solar Radiation (our standard sensor) and non-amplified solar radiation sensors with external amplifiers.

IR Surface Temperature (used in custom applications)

Temperature (2210) an alternative temperature sensor (used in custom applications).

For custom sensors see the 8-Channel MicroServer section.



# SECTION 3: INSTALLATION

The MicroServer should be installed in a clean, dry location.

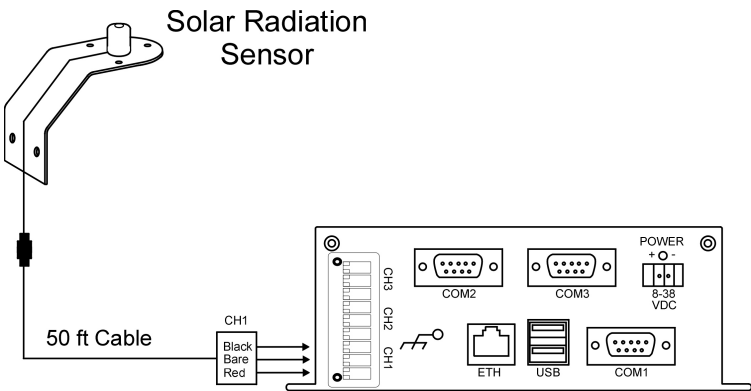
Before installing the MicroServer, the network settings may need to be changed in order for the MicroServer to be visible on the network. See Network Setup in the Operation Section for additional information.

Connect an Ethernet cable from the Ethernet port of the MicroServer to a network device such as router, hub or switch.

## Sensor Connections

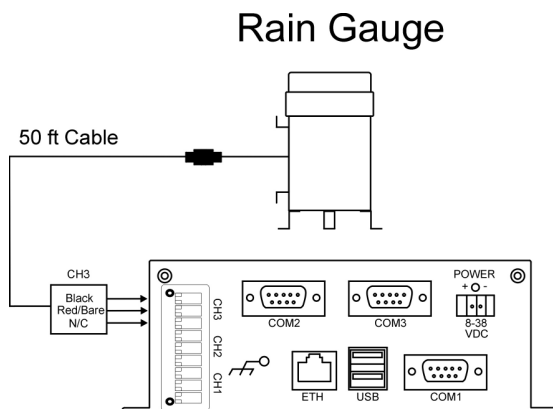
### Solar Radiation Sensor (Pyranometer) Interface

A solar radiation sensor can be connected to channel one (CH1) or channel 2 (CH2) on the MicroServer as shown below:



## Tipping Bucket Rain Gauge Interface

A tipping bucket rain gauge can be connected to channel three (CH3) on the MicroServer as shown below:



## Grounding the MicroServer Chassis

The MicroServer chassis includes a lug on the front panel for grounding the unit to Earth Ground.

A 14 to 16 AWG copper wire is recommended.

## Weatherproof Enclosure

For outdoor installations, the MicroServer can be housed in a 12"x10"x6" weatherproof enclosure.



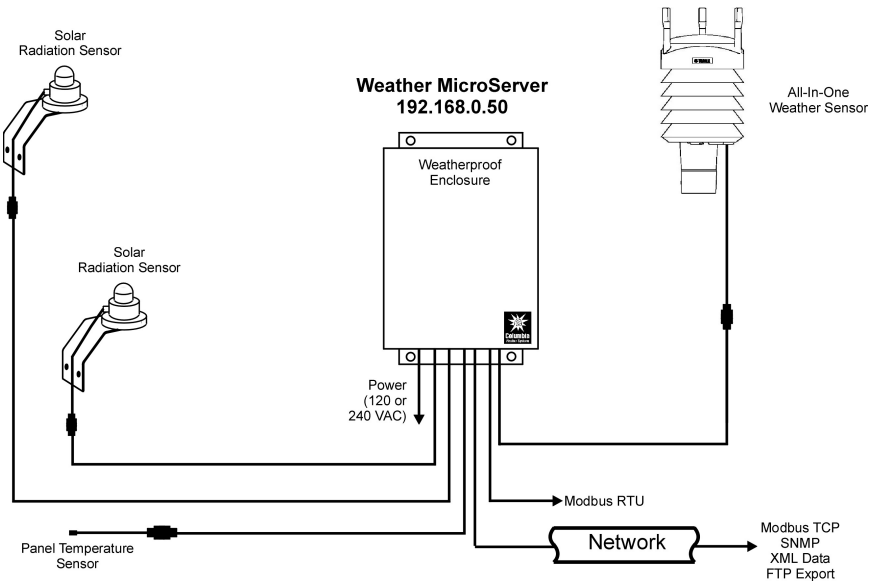
The system enclosure includes a power supply, mounting panels, terminal blocks for sensor connections as well as hardware to mount the enclosure onto a mast.

The enclosure houses the MicroServer and Interface Module. The enclosure also includes a connection diagram.

A lug on the outside of the enclosure is provided for grounding the unit to Earth Ground. A 14 to 16 AWG copper wire is recommended for proper grounding.



## 8-Channel MicroServer in Weatherproof Enclosure



### Installing the panel temperature sensor

The panel temperature sensor can be attached to the back of the solar panel using a 5-minute epoxy (not supplied).

Use tie wraps to secure the cable to the panel frame.

Connect the panel temperature sensor to the specified analog channel on the MicroServer according to the connection diagram provided with the system.

Using a #1 Straight Slot screwdriver, attach the wires from the end of the sensor cable to the green terminal block screws on the MicroServer as follows:

Pin Number	Function	Color
1	+5 V	Red
2	Ground	Bare
3	Signal	Black

# Installing the standard solar radiation sensor

The standard solar radiation sensor can be installed on the mast using the hardware included to provide solar radiation measurement or to the solar panel frame to provide plane of array solar measurement.

Connect the solar sensor to the specified analog channel on the MicroServer according to the connection diagram provided with the system.

Using a #1 Straight Slot screwdriver, attach the wires from the end of the sensor cable to the green terminal block screws on the MicroServer as follows:

Pin Number	Function	Color
1	+5 V	Red
2	Ground	Bare
3	Signal	Black



# SECTION 4: OPERATION

## Weather MicroServer User Interface

The Weather MicroServer utilizes a browser user interface. The MicroServer is configured at the factory with IP address 192.168.0.50.

The IP address along with other network settings can be changed to match the local network configuration. Please see Network Setup for more information.

Once the MicroServer is connected to the network, open an Internet browser such as Internet Explorer and type in the following address:

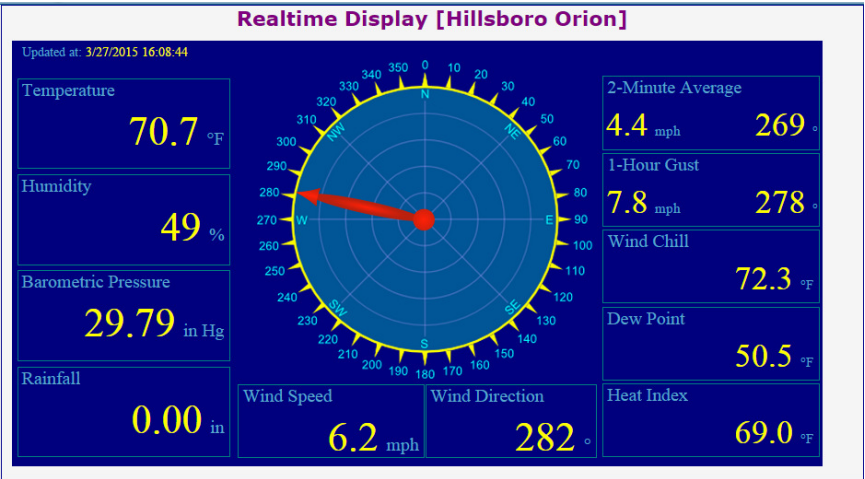
http://192.168.0.50

If this IP address is already being used by another device, see Network Setup in the Operation Section.

Note: please enter your own IP address if it has been changed from the 192.168.0.50 default.

When the User Interface is accessed, the Realtime Display screen will be displayed.

## Realtime Display



The Realtime Display screen displays the station name and the main parameters in the selected units.

Please note that the Realtime Display is not compatible with Internet Explorer version 7 or 8 without the Adobe SVG plug in.

Internet Explorer version 9 and beyond, Chrome, and Firefox are all compatible with this screen.

If accessing the MicroServer through an intranet with Internet Explorer click on the Tools icon and select Compatibility View Settings uncheck "Display intranet sites in Compatibility View", click Close.

## Latest Measurements

### Latest Measurements [Hillsboro Orion]

Sample Timestamp:	2015/03/27 16:10:12
Temperature:	70.8 °F
Wind Chill:	72.6 °F
Heat Index:	69.0 °F
Dew Point:	50.6 °F
Degree Days:	52.0 °F
Density Altitude:	1094 ft
Average Temperature Today:	69.6 °F
Wet Bulb Globe Temperature:	70.0 °F
Saturated Vapor Pressure:	0.76 in Hg
Vapor Pressure:	0.37 in Hg
Dry Air Pressure:	29.42 in Hg
Dry Air Density:	0.0736 lb/ft3
Absolute Humidity:	0.0006 lb/ft3
Air Density Ratio:	1 %
Adjusted Altitude:	1122 ft
SAE Correction Factor:	0.988
Wet Air Density:	0.0742 lb/ft3
Wet Bulb Temperature:	57.7 °F
Relative Humidity:	49 %
Wind Speed:	5.1 mph

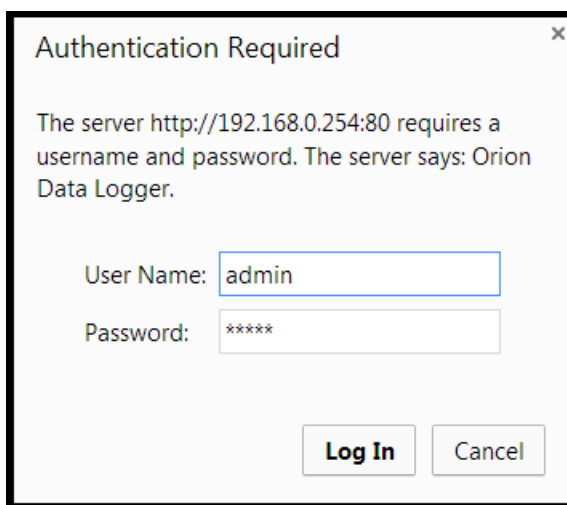
The Latest Measurements page displays the current parameter values in the selected units. Refreshing the browser will update the readings as needed.

Only the selected parameters in the Selected Measurements page will be displayed.

The Latest Measurements page also displays the station name.

## Device Admin

To access the administrative area of the User Interface click on the Device Admin menu item. The user will be prompted to enter a user name and password.

A screenshot of a web browser dialog box titled "Authentication Required" with a close button (X) in the top right corner. The text inside the dialog reads: "The server http://192.168.0.254:80 requires a username and password. The server says: Orion Data Logger." Below this text are two input fields. The first is labeled "User Name:" and contains the text "admin". The second is labeled "Password:" and contains six asterisks "\*\*\*\*\*". At the bottom right of the dialog are two buttons: "Log In" and "Cancel".

Authentication Required

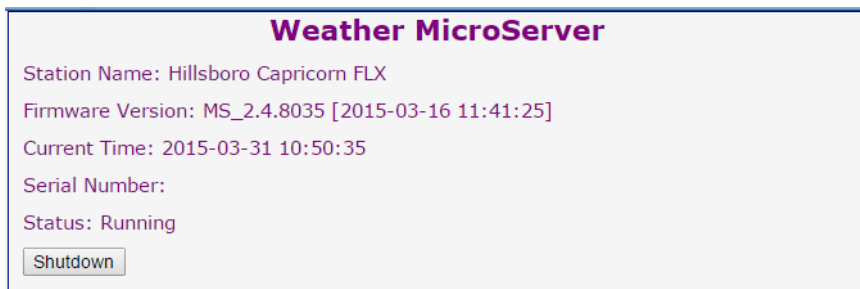
The server http://192.168.0.254:80 requires a username and password. The server says: Orion Data Logger.

User Name:

Password:

The default user name is **admin** and the default password is also **admin**. If the password has been changed and lost, please contact Columbia Weather Systems for assistance.

## Home Page

A screenshot of the Weather MicroServer Home Page. The title "Weather MicroServer" is at the top in a large, bold, purple font. Below the title, several lines of text are displayed in a purple font: "Station Name: Hillsboro Capricorn FLX", "Firmware Version: MS\_2.4.8035 [2015-03-16 11:41:25]", "Current Time: 2015-03-31 10:50:35", "Serial Number:", and "Status: Running". At the bottom left, there is a button labeled "Shutdown".

**Weather MicroServer**

Station Name: Hillsboro Capricorn FLX

Firmware Version: MS\_2.4.8035 [2015-03-16 11:41:25]

Current Time: 2015-03-31 10:50:35

Serial Number:

Status: Running

The Home page is an informational page that includes the station name, firmware version, current time, serial number, and status.

The displayed time is the time generated by the real-time clock in the MicroServer. Be sure to refresh the browser for the current time.

The MicroServer status is Running or Stopped. The Data Manager software starts automatically on power up.

## Shutdown

Click the Shutdown button to stop the Data Manager and ensure a proper shutdown.

## Station Name

A screenshot of a web-based dialog box titled "Change Station Name" in a large, bold, purple font. Below the title, the text "Station Name:" is followed by a text input field containing the text "Hillsboro Weather Station". The input field has a yellow border. Below the input field are two buttons: "Apply Changes" and "Cancel Changes", both with a light blue background and a thin border.

Change the station name to reflect the station location, company name or function.

The station name will be displayed on the browser top bar.

This name will identify this station in the Home page, Realtime Display screen, Latest Measurements page and in the XML data file.

## Network Setup

### Network Setup

IP Address:	<input type="text" value="192.168.0.50"/>
Subnet Mask:	<input type="text" value="255.255.255.0"/>
Gateway:	<input type="text" value="192.168.0.1"/>
DNS Server:	<input type="text" value="192.168.0.1"/>

Network Setup page allows the user to change the IP address, subnet mask, gateway, and DNS Server settings.

The MicroServer factory settings are as follows:

IP address 192.168.0.50

Subnet Mask: 255.255.255.0

Gateway: 192.168.0.1

DNS Server: 192.168.0.1

If the network subnet mask, gateway or DNS server settings are different than the above, the MicroServer settings must be changed to match the network in order for the MicroServer to be visible on the network.

To change the MicroServer network settings:

1. Connect the MicroServer to a stand-alone computer (not connected to the network) via a standard or a crossover Ethernet cable.
2. Change the computer network settings to match the MicroServer settings shown above with the exception of the IP address. Use IP address 192.168.0.49 for the computer. Contact Network Administrator for assistance.
3. Browse the MicroServer at <http://192.168.0.50>
4. In the MicroServer User Interface, click on Network Setup and change the settings to match your network.
5. Click on Apply Changes.
6. Disconnect the MicroServer from the stand-alone computer and connect it to the network using a regular Ethernet cable.
7. Browse the MicroServer from the network to verify that the changes are successful.
8. Change the computer network settings to original settings.



## Change Password

### Change Password

Admin password:

Re-enter password:

Change Password page allows the user to change the Admin password.

## Date and Time

### Set Date and Time

Current Date and Time: 2015-03-27 16:16:40

Date (yyyy-mm-dd):

Time (hh:mm:ss):

Time Zone:

[NTP time synchronization settings](#)

Date and Time page allows the user to change the MicroServer date and time.

The data should be in yyyy-mm-dd format.

The time should be in hh:mm:ss format. Please be sure to enter the seconds when setting the time.

Select the time zone from the drop-down menu. The United States regional time zones are listed near the bottom of the list.

The MicroServer date and time is stamped on all records.

**Reboot the MicroServer after the date and time have been set.**

## NTP Time Synchronization

### Time Synchronization Settings

NTP time synchronization:

NTP Server:

To synchronize the time with an NTP time server click “NTP time synchronization settings”. Choose “Enable” from the NTP time synchronization drop-down menu.

Click Date and Time, select the correct time zone for the station location from the drop-down menu.

Enter the correct time in manually, click Apply Changes.

### Reboot the MicroServer for changes to effect.

The NTP time synchronization setting is enabled by default.

The default NTP time server is pool.ntp.org.

## Data Inputs

### Data Inputs

Station Type:

COM1:

COM2:

COM3:

### Additional Onboard Sensors

Tipping Bucket Rain Input:

Analog Channel 1:

Analog Channel 2:

Analog Channel 3:

Analog Channel 4:

Analog Channel 5:

Analog Channel 6:

Analog Channel 7:

Analog Channel 8:

### Custom Analog Sensors

Name	Factor	Offset
<input type="button" value="New Sensor"/>		

The Data Inputs page allows the user to configure all the serial (COM) ports and digital and analog channels.

### COM1 (Primary Input)

Select “Orion” if connected to an Orion Weather Station.

Select “Capricorn” if connected to either a Capricorn 2000, Capricorn 2000EX or Pegasus EX Weather Station.

Select “Capricorn FLX” if connected to a Capricorn FLX, or Pegasus FLX Weather Station.

Select “Magellan” if connected to a Magellan Weather Station.

Select “Vela” if connected to a Vela Weather Station.

Select “Pulsar (RS232)” if connected to a Pulsar Weather Station.

## COM2

To output the adjusted raw sensor data on COM2 to other devices such as the LCD Display Console, select “Output adjusted COM1 data.”

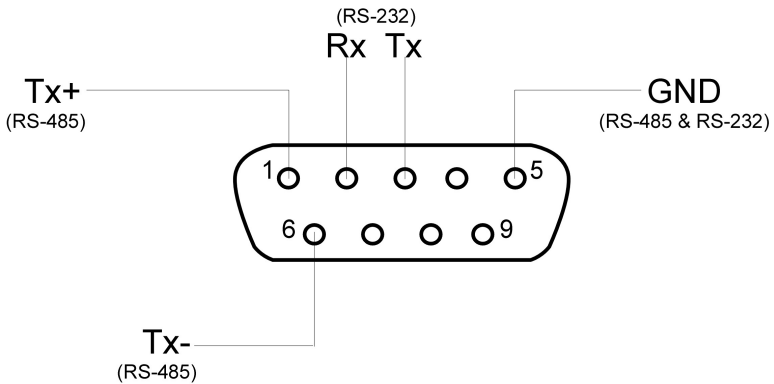
To interface a second wind sensor, select “Input from Orion LT sensor”.

To interface a Pulsar sensor using RS-485 communication, select “Pulsar (RS485)”.

To interface a PTB330 Pressure Sensor, select “Input from PTB330 Pressure Sensor”.

To enable Modbus RTU (Serial RS-485) see the Data Outputs section.

To properly configure a DB-9 connector for RS-485 connection follow the diagram below.



Note: If Modbus RTU is selected in the Data Outputs screen, then COM2 selections will not be available. Modbus RTU uses COM2 for communication.

## COM3

Select “Input TNT Compass data” if an electronic compass is connected to the MicroServer.

Select “Input Visibility data” if a visibility sensor is connected to the MicroServer.

Select “Input Particle Concentration Data” if an ES-642 Dust Monitor is connected to the MicroServer.

### **Tipping Bucket Rain Input:**

Select “Enabled” if a tipping bucket rain gauge is connected directly to CH3 on the MicroServer.

## **8-Channel MicroServer**

The 8-Channel MicroServer utilizes eight analog channels for connecting additional analog sensors. The first three channels are available on the front panel of the MicroServer.

The remaining five analog channels are made available on DIN Rail mount terminal blocks.

All analog channels are 0 to 2.5 VDC input.

The MicroServer can accept the following sensors:

Amplified Solar Radiation (our standard sensor) and non-amplified solar radiation sensors with external amplifiers.

IR Surface Temperature (used in custom applications)

Temperature (AD36). This is our standard air, soil/water, or PV panel temperature sensor.

Temperature (2210) an alternative temperature sensor (used in custom applications).

All analog channels are configured as follows:

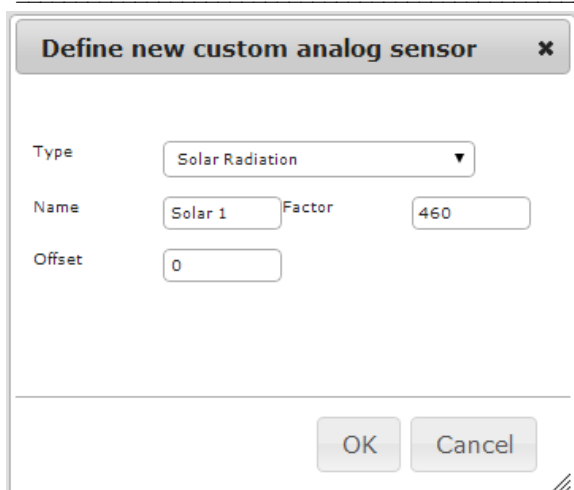
Pin 1: +5VDC supply voltage

Pin 2: Ground

Pin 3: 0 to 2.5VDC signal input

### **Custom Analog Sensors**

The user also has the ability to define custom solar radiation, temperature, relative humidity, barometric pressure, PAR and wind direction sensors.



**Define new custom analog sensor** ✕

Type: Solar Radiation ▼

Name: Solar 1 Factor: 460

Offset: 0

OK Cancel

Select the type of sensor.

Enter a name for the sensor.

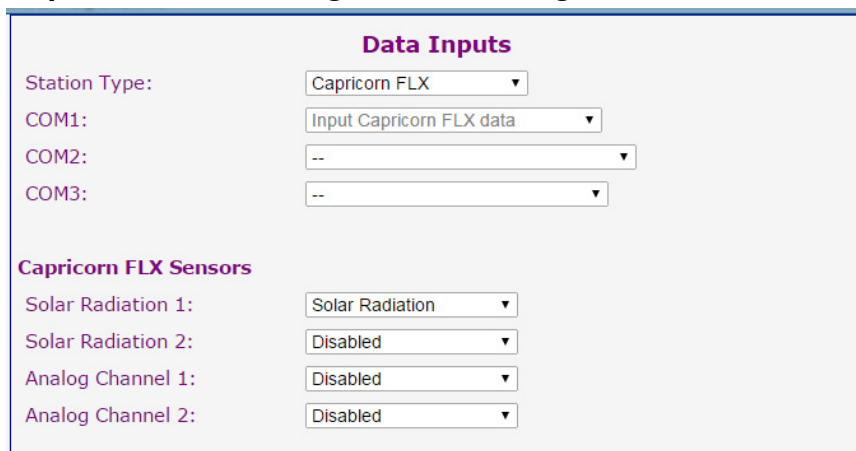
Enter a Factor and Offset.

Click OK when finished.

The new sensor will now be available for selection from the Analog Channel sensor drop-down menu.

Click Apply Changes when finished.

## Capricorn FLX Analog Sensor Configuration



**Data Inputs**

Station Type: Capricorn FLX ▼

COM1: Input Capricorn FLX data ▼

COM2: -- ▼

COM3: -- ▼

**Capricorn FLX Sensors**

Solar Radiation 1: Solar Radiation ▼

Solar Radiation 2: Disabled ▼

Analog Channel 1: Disabled ▼

Analog Channel 2: Disabled ▼

The Capricorn FLX Weather Station utilizes four (4) analog input channels for additional sensors.

All analog channels are 0 to 2.5 VDC input.

To configure a sensor for any of the analog channels choose the appropriate sensor from the correct drop-down menu.

Solar Radiation channels 1 & 2 are reserved for the standard solar radiation sensor.

The analog channels on the Capricorn FLX Control Module can accept the following sensors:

Amplified Solar Radiation (our standard sensor) and non-amplified solar radiation sensors with external amplifiers.

IR Surface Temperature (used in custom applications)

Temperature (AD36). This is our standard air, soil/water, or PV panel temperature sensor.

Temperature (2210) an alternative temperature sensor (used in custom applications).

All analog channels are configured as follows:

Pin 1: +5VDC supply voltage

Pin 2: Ground

Pin 3: 0 to 2.5VDC signal input

### Custom Analog Sensors

The user also has the ability to define custom solar radiation, temperature, relative humidity, barometric pressure, PAR and wind direction sensors.

**Define new custom analog sensor** ✕

Type: Solar Radiation ▼

Name: Solar 1 Factor: 460

Offset: 0

OK Cancel

Select the type of sensor.

Enter a name for the sensor.

Enter a Factor and Offset.

Click OK when finished.

The new sensor will now be available for selection from the Capricorn FLX Analog Channel drop-down menus.

Click Apply Changes when finished selecting the custom sensor.

## Data Output

Data Output		
Weather Underground Output	Disabled ▼	Settings
AnythingWeather Output:	Disabled ▼	Settings
CWOP Output:	Disabled ▼	Settings
Daily log file upload:	Disabled ▼	Settings
FTP Output:	Enabled ▼	Settings
Dnp3 Output:	Disabled ▼	Settings
Modbus Output:	Disabled ▼	Settings
Bacnet Output:	Disabled ▼	Settings
SNMP Output:	Disabled ▼	<a href="#">Show MIB file</a>
Diagnostic Logging :	Verbose Logging ▼	
<input type="button" value="Apply Changes"/> <input type="button" value="Cancel Changes"/>		

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### Weather Underground Output:

To upload the weather data to Weather Underground, please go to: [www.wunderground.com](http://www.wunderground.com), register (create a password and username) and add a station (create a Station ID).

In the MicroServer Data Output screen, select “Enabled” For the Weather Underground Output.

Click on Settings to configure the output. Enter the Weather Station ID and Password and click OK.

### AnythingWeather Output:

To upload the weather data to Anything Weather, please go to: [www.anythingweather.com](http://www.anythingweather.com), and join the network by filling out a contact request form.

In the MicroServer Data Output screen, select “Enabled” For the AnythingWeather Output.

Click on Settings to configure the output. Enter the Weather Station ID and Password and click OK.

## CWOP Output

To upload the weather data to the Citizen Weather Observer Program (CWOP), please go to <http://www.findu.com/citizenweather/signup.html> to setup a Call Sign/Station ID (CW number). You will need to fill out and submit a web form to receive the Call Sign (or CW number)

In the Parameter Settings page of the MicroServer, please be sure to enter your station Latitude and Longitude.

To output weather data to CWOP, select “Enabled” in the Data Output screen.

Click on Settings to configure the output.

Enter the Call Sign/Station ID/CW Number assigned by CWOP (upper case letters).

Enter **cwop.aprs.net** for the Server.

Enter **14580** for the Port (use **23** if you are experiencing issues)

Enter **-1** for the password. This is the Validation Number.

Click OK and then Apply Changes.

CWOP updates every 400 seconds, approximately every 6 minutes.

## Daily Log File Upload

The daily log file is generated at the start of each day (or when there is a change in parameter selection) and is uploaded at the end of each day at midnight.

Enable the Daily log file upload and click on the Settings button.

Enter in the FTP Host/Directory/, User Name, and Password then click OK.

Do not include ftp:// in the FTP Host name. Simply enter the host name.

Include a trailing forward slash after the directory name.

Click Apply Changes.

## FTP Output

The FTP output enables the MicroServer to send weather data files to FTP servers over the Internet.



Enter the FTP URL, user, and password. If the FTP site is not secure and does not require a user name and password, enter **anonymous** for the user name and leave the password blank.

The URL (Uniform Resource Locator) is the FTP server address or name and it should end in */filename*

*Filename:* The file name that will be uploaded to the FTP server with the proper extension. If the output format is XML, the extension is .xml. If the output is CSV, the extension is .csv or .txt.

Choose the desired output format. The output format is dependent on how the data will be used at the FTP server.

XML (Extensible Markup Language) is a data description file that also contains the data. The XML file will contain the current measurements. This format is useful for generating web pages containing weather data and for interfacing with other software programs.

Standard XML includes the selected parameters with U.S. customary units. The units are implied and are not included in the file.

Enhanced XML includes the selected parameters with the user selected units. The units are included in the file.

CSV (comma-separated values) file contains the data separated by commas. The field order in the record is based on the same order of the selected measurements in the Selected Measurements page. Two output formats are available:

CSV-append data format will generate a file with comma-separated records every 15 seconds without overwriting the previous data.

CSV-overwrite data format will generate a file with one (the latest) comma-separated record. This file will update every 15 seconds and overwrite the previous record.

## DNP3 Interface

The Weather MicroServer offers DNP3 Ethernet communication to interface the weather station with process automation systems.

Master address: 1 - 65535

Slave address: 1 - 65535

TCP port: 20000 (default)

Date type: Float

Client access: Read Only

Address: 30.5.X.Explicit, where X = the DNP3 index number

See Appendix D for the DNP3 Index List

A complete and updated DNP3 Index List is also available from our website at:

<http://www.columbiaweather.com/resources/manuals-and-brochures/ms-docs/bacnet-parameters.pdf>

## SNMP Interface

SNMP: Simple Network Management Protocol. The Weather MicroServer has a built-in SNMP interface for communication with network management systems. SNMP version 2 and version 3 are supported.

Click on Show MIB file to view the MIB definitions and objects for the MicroServer.

### SNMP Version 2

To get all SNMP values use the following command line:

```
snmpwalk -v 2c -c public -m ALL 192.168.0.50 orionScalarData
```

To get a specific value use the following command:

```
snmpget -v 2c -c public -m ALL 192.168.0.50 omAdjWindDir-Value.0
```

(Other files can be retrieved from the MIB file)

(Use the correct IP address of your MicroServer. Default IP address is used in the examples above.)

Note: Make sure the firewall is not causing interference.

### SNMP Version 3

Select the Encryption Style; DES (Data Encryption Standard) or AES (Advanced Encryption Standard).

Create a User Name and Password.

To get all SNMP values use the following command line:

AES Encryption Style:

```
snmpwalk -v 3 -n "" -u username -a SHA -A "password" -x AES -X password -l authPriv -m ALL 192.168.0.50 orionScalarData
```

DES Encryption Style:

```
snmpwalk -v 3 -n "" -u username -a SHA -A "password" -x DES -X password -l authPriv -m ALL 192.168.0.50 orionScalarData
```

(Use the correct IP address of your MicroServer. The default IP address is used in the example above.)

## BACnet Interface

The Weather MicroServer has a built-in BACnet interface for communication with building automation and control systems.

Device ID: 1 – 4194304

UDP: 47808

See Appendix E for the BACnet Index List

A complete and updated BACnet Index List is also available from our website at:

<http://www.columbiaweather.com/resources/manuals-and-brochures/ms-docs/bacnet-parameters.pdf>

## Modbus Interface

The Weather MicroServer has built-in Modbus TCP/IP and RTU slave interfaces for communication with industrial automation systems and OPC servers.

The MicroServer offers both 32-bit and 16-bit scaled integer registers.

Modbus registers are updated every 3 seconds.

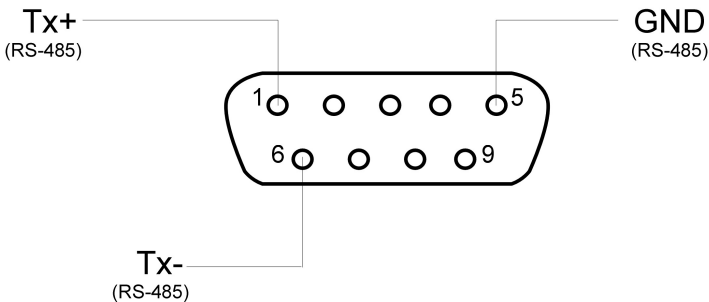
See Appendix C for the Modbus Point Lists

A complete and updated Modbus Point List is also available from our website at:

<http://www.columbiaweather.com/resources/manuals-and-brochures/ms-docs/modbus-point-list.pdf>

Modbus TCP/IP is available through the Ethernet port.

Modbus RTU communication is through the RS-485 port on COM 2. The RS-485 port is configured as follows:



Pin 1: TX+

Pin 5: Ground

Pin 6: TX-

All Modbus register values are reported in U.S. customary units.

For Modbus configuration, click on the Settings button.

### **Modbus RTU**

Select Enabled from the drop-down menu. Click the Settings button, select "Serial (COM2) RTU" from the Modbus Output drop-down menu, click OK, and then click Apply Changes.

Enter the Modbus address, baud rate, and parity. The data bits are set to 8 and the stop bits are set to 1.

### **Modbus TCP/IP**

Select Enabled from the drop-down menu. Click the Settings button, select "TCP" from the Modbus Output drop-down menu, enter in an address number, click OK, and then click Apply Changes.

### **Modbus Point List (32-bit)**

See Appendix C for the 32-bit register list.

All data is accessed via read only input registers.

[Modbus Function Code 04]

Data type Long = Signed 32 bit value

Data type Float = 32 bit floating point value

For each available measurement, the two registers immediately following the value contain the most recently updated posix time value. For example: the Wind Speed value is stored in registers 5 and 6. The last updated timestamp is stored in registers 7 and 8 and is a 32-bit integer value.

The posix time values are 32-bit integers; all the values are Modbus input registers.

### **Modbus Point List (16-bit Scaled Integers)**

See Appendix C for the 16-bit register list.

The 16-bit scaled integer registers are available for most parameters.

The 16-bit point list includes a minimum, maximum, factor, and offset value for each parameter.

Parameter value = (unsigned 16-bit Integer + Offset)/Factor

For example:

Wind speed is register 2002

Factor = 368

Offset = 0

If the register value is 1950

Then wind speed =  $(1950 + 0)/368 = 5.3$  mph

If the number is negative, you must convert it to an unsigned value using the following formula: unsigned value = 65536 + signed value.

Then use the following formula to convert to the actual floating point value: float value = (unsigned value + offset)/factor. The offset and factor are available from the Modbus point list.

## Diagnostic Logging

Is set to Verbose Logging by default. The diagnostic logging is used by Technical Support to troubleshoot problems with the MicroServer.

## Data Logs

### Data Log Files

- [20121220-085730.txt](#)
- [20121220-000029.txt](#)
- [20121219-124633.txt](#)
- [20121219-000006.txt](#)
- [20121218-104903.txt](#)
- [20121218-081404.txt](#)
- [20121218-000019.txt](#)
- [20121217-163915.txt](#)
- [20121217-083903.txt](#)
- [20121217-000040.txt](#)
- [20121216-000034.txt](#)
- [20121215-000029.txt](#)
- [20121214-093734.txt](#)
- [20121214-000048.txt](#)
- [20121213-165948.txt](#)
- [20121213-155531.txt](#)

For a more convenient way of exporting trend data from a microserver, download and install the Microserver Log Exporter: [Click here to download](#)

The Weather MicroServer automatically saves a complete record of all the selected parameters every minute. The data is saved in a daily record. If a change is made to the list of selected parameters, a new file for the day is generated.

The Data Log files are comma delimited text files. Each file has a header with all the parameter names.

The Data Log file names are based on year-month-day-time format.

The MicroServer stores approximately one year's worth of data. When data log memory is full, the oldest file is deleted as the new file is stored.

### MicroServer Log Exporter

The MicroServer Log Exporter can be used for a more convenient way of exporting the data log file as "CSV" file. The Log Exporter can be downloaded from the Data Logs page.

## Configuration File

### Configuration File

```
<?xml version="1.0"?>
<config version="1.1">
  <StateSaveInterval>60</StateSaveInterval>
  <outputs>
    <output>
      <outputType>LOCALFILES</outputType>
      <WriteInterval>1</WriteInterval>
    </output>
    <output disabled="true">
      <outputType>FTP</outputType>
      <OutputUrl>ftp://localhost/oriondata.xml</OutputUrl>
      <OutputFormat>XML</OutputFormat>
    </output>
  </outputs>
  <inputs>
    <input>
      <inputType>WXT</inputType>
      <command>wxtdi --serialinput /dev/tty00 --loglevel -3</command>
    </input>
  </inputs>
  <params>
    <param key="F_ALTITUDE" value="0"/>
    <param key="F_BARPRESS_OFFS" value="0"/>
    <param key="I_DDSTART_DOM" value="24"/>
    <param key="I_DDSTART_MON" value="4"/>
  </params>
  <StationName>New Microserver</StationName>
  <LogLevel>3</LogLevel>
  <Measurements>
    <Measurement mkey="ORION:mtTemp">mtTemp</Measurement>
  </Measurements>
</config>
```

The Configuration File page displays the configuration file and allows the user to edit and apply changes.

All User Interface configurations are stored in this file.

Changes to the configuration file should be reserved for advanced users and customer service.

If the file has been inadvertently changed, the Restore Defaults button will load the factory default file.

Note: Choosing to restore defaults will delete custom sensors and clear all settings.

The configuration file can be saved to the user's computer by clicking Save/Download to File. The configuration information will be saved as an XML file. If the user settings are lost or changed, the file can be restored by clicking Load from File and selecting the saved XML file.

## Measurements

### Selected Measurements

**Orion Serial** [Select All](#) [Select None](#) [Show Inputs](#)

<input checked="" type="checkbox"/> Temperature	=> Temperature
<input checked="" type="checkbox"/> Wind Chill	=> Wind Chill
<input checked="" type="checkbox"/> Heat Index	=> Heat Index
<input checked="" type="checkbox"/> Dew Point	=> Dew Point
<input checked="" type="checkbox"/> Degree Days	=> Degree Days
<input checked="" type="checkbox"/> Density Altitude	=> Density Altitude
<input checked="" type="checkbox"/> Average Temperature Today	=> Average Temperature Today
<input checked="" type="checkbox"/> Wet Bulb Globe Temperature	=> Wet Bulb Globe Temperature
<input checked="" type="checkbox"/> Saturated Vapor Pressure	=> Saturated Vapor Pressure

The Selected Measurements page allows the user to customize the measurements/parameters that will be displayed on the Latest Measurements page and the Realtime Display page.

Only the selected parameters in the Selected Measurements page will be displayed and recorded in the data log files.

To display a particular measurement on the Latest Measurements page, select the corresponding parameter on the Selected Measurements page.

Click Apply Changes.

### Selected Measurements

**Orion Serial** [Select All](#) [Select None](#) [Hide Inputs](#)

☒ Temperature ☒ Humidity ☒ Wind ☒ Pressure ☒ Rain ☒ Hail

The various input types can be quickly selected or deselected using the input feature shown above. This feature allows the user to customize the display of the Latest Measurements page.



## Analog Channels

<b>Analog Channel 1</b>	
<input checked="" type="checkbox"/> Solar Radiation	=> Solar Radiation
<b>Analog Channel 2</b>	
<input checked="" type="checkbox"/> Temperature	=> Temperature 2
<b>Analog Channel 3</b>	
<input checked="" type="checkbox"/> PAR	=> PAR
<input type="button" value="Apply Changes"/>	<input type="button" value="Cancel Changes"/>

The Selected Measurements page allows the user to select or deselect additional sensors connected to the available analog channels. Once selected, the parameter name will appear to the right of the sensor type.

To display the measurement of a particular sensor on the Latest Measurements page, select the sensor and click Apply Changes on the Selected Measurements page.

Please note that the Selected Measurements screen is not compatible with Internet Explorer 6 or 7.

## Units

### Selected Units

Rain:

Temperature:

Wind Speed:

Pressure:

Altitude:

Visibility:

Rain Rate:

The Units page allows the user to select the desired units for the weather parameters in the Enhanced XML output as well as the Realtime Display and the Latest Measurements pages.

Please note that the data log files and the Standard XML and CSV outputs always use U.S. customary units. In addition, Modbus and SNMP interfaces report only in U.S. customary units.

## Parameter Settings

### Parameter Settings

Altitude (feet):

Latitude:

Longitude:

Barometric press. offset (in Hg):

Temperature 1 offset (°F):

Wind Direction offset (°):

Degree day start month:

Degree day start day (1-31):

Degree day reference temp. (°F):

Rain Offsets: [Edit rain offsets](#)

The Parameter Settings page allows the user to enter station specific data.

**Altitude:** The elevation of the station, specifically the sensor transmitter. This setting will change the adjusted Barometric Pressure reading. Altitude is in feet.

**Latitude and Longitude:** Enter both values in decimal format. These two values are used in the CWOP output. For west and south, enter as negative values.

**Barometric pressure offset:** This offset allows the user to calibrate the barometric pressure sensor to match a local standard. Barometric Pressure Offset is set in Inches Hg.

**Temperature 1 offset:** This offset allows the user to adjust the temperature reading. The offset is in °F.

**Wind Direction offset:** This offset allows the user to adjust the wind direction reading. The offset is in degrees (°).

**Degree Day:** For degree day calculations, enter the start month, start day and reference temperature.

## Rain Offsets

### Edit Rain History

**Rain Totals for 2013-10-28 (excluding today's rain)**  
 Rain for the week: 0.00  
 Rain for the month: 0.39  
 Rain for the year: 6.20

Date	Inches
Year offset	5.81
2013-10-01	0.24
2013-10-02	0.01
2013-10-06	0.03
2013-10-07	0.04
2013-10-26	0.07

This screen displays the rain accumulation for the week, month, and year (excluding today's rain accumulation).

The rain values can be adjusted for any day that has rain accumulation during the current month by clicking on the inches recorded.

Date	Inches
Year offset	5.81
2013-10-01	<input style="width: 150px;" type="text" value="0.24"/> <input type="button" value="Save"/> <input type="button" value="Cancel"/>
2013-10-02	0.01
2013-10-06	0.03
2013-10-07	0.04
2013-10-26	0.07

# Firmware Update

## Update Firmware

Current Version: MS\_2.4.8035 [2015-03-16 11:41:25]

To update firmware, you must enter Recovery Mode by clicking the button below.

Firmware updates may be made available on Columbia Weather Systems' web site ([www.columbiaweather.com](http://www.columbiaweather.com)), or can be emailed directly to the user.

The update firmware file has an ".msu" extension and does not need to be unzipped or altered in any way. Copy the file to a computer on the network.

**Weather Device Recovery Mode**  
BOOTFROM=cons  
Firmware Version: "MS\_2.4.8035 [2015-03-16 11:41:25]"  
IP Address: 192.168.0.71

To upgrade the MicroServer firmware click on Update Firmware, then click Enter Recovery Mode to boot the MicroServer into the upgrade environment. Once in Recovery Mode click Update Firmware, click Choose File and select the firmware file. Click Update Firmware to install the new firmware file and begin the upgrade process. The update will take up to 5 minutes.

The MicroServer can also be updated using a USB Flash drive. Please contact Columbia Weather Systems for a USB firmware image.

**It is very important that the power is not disconnected from the Weather MicroServer during this process. Do not attempt firmware update during periods of power uncertainty.**

# Diagnostics

## Diagnostics

Firmware Version: MS\_2.4.8421 [2015-09-28 13:02:34]  
Kernel Version: 3.14.0-00066-ge42dc59-dirty  
Hardware Model: sds-msng  
Serial Number: 8-112055  
RS485 Available: yes  
Current Time: 2015-10-02 12:21:19 PDT  
Hardware Time: Fri Oct 2 12:21:19 2015 0.000000 seconds  
MAC address: 1C:BA:8C:E3:ED:80  
IP address: 192.168.0.50  
Subnet mask: 255.255.255.0  
Gateway: 192.168.0.1  
DNS Server: 192.168.0.1  
Data Manager Status: Running  
Device Status: up 2 days, 4:45, load average: 0.01, 0.03, 0.04  
Device running from: flash  
SD card status: ok  
User: 0  
System: 0  
Idle: 100

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[Start Data Manager](#) [Stop Data Manager](#) [Restart Data Manager](#)

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The Diagnostics page displays system information.

## Start Data Manager

The Data Manager software starts automatically on power up. In the event the software has been stopped, click Start Data Manager to start the software.

## Stop Data Manager

Click on Stop Data Manager to stop the software. The user will still have access to the User Interface after the software is stopped.

## **Restart Data Manager**

Click on Restart Data Manager to stop the software and then start it again. This feature is similar to a computer reboot.

## **Reboot**

Reboot button restarts the operating system. Please wait 30 seconds before clicking the Continue button to allow the system to fully boot back up.

## **Format SD Card**

In the event that the SD card has been corrupted or lost the user has the option to format the SD Card.

Please note: Formatting the SD Card will delete all of the data on the card.

## **Recovery Mode**

By clicking Enter Recovery Mode the MicroServer reboots into a separate user interface where the user can update firmware, save device settings, and restore the unit to factory settings.

## **Update Firmware**

See the Update Firmware section for more information.

## **Update Firmware from USB**

The firmware can also be upgraded through a USB flash drive. Contact Columbia Weather Systems for more information.

## **Restore Factory Settings**

In the event a problem occurs with the MicroServer the user can enter Recovery Mode and restore the factory settings by clicking Restore Factory Settings. This action will revert the unit back to the default IP address of 192.168.0.50.

## **Save Device Settings**

The user can save the current device settings including network settings, administrator password, and other device configuration settings by clicking Save Device Settings then clicking Download Device Settings. The device settings file will automatically download.

## Restore Saved Device Settings

In the event that device configuration settings are inadvertently changed the device settings file can be uploaded to restore the unit with the saved settings. This can be done by clicking Restore Saved Device Settings, Choose File, select the “cw\_device\_settings.tar” file, finally click Restore Settings.

## Safe Shutdown

Click Safe Shutdown to properly shut down the MicroServer before disconnecting power.

## Boot back to Recovery Mode

If a firmware upgrade is required and the unit has been in recovery mode longer than five minutes the unit will need to be rebooted by clicking Boot back to Recovery Mode.

## Boot to Run Mode

To boot the unit back into the main user interface click Boot to Run Mode.

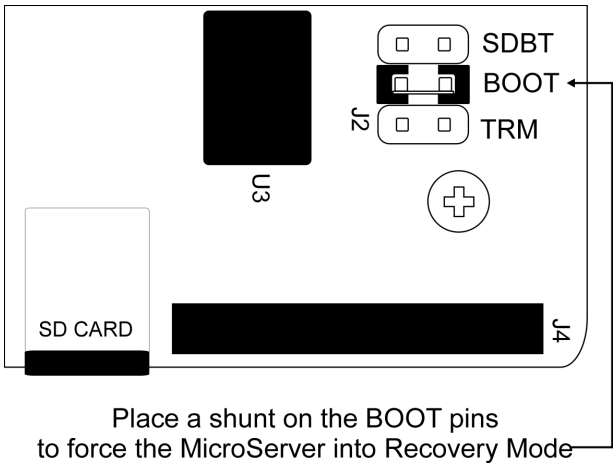
## Manual Recovery Mode Entry

In the event that configuration settings are lost, the administrative password is forgotten or the MicroServer has been corrupted the user has the option to manually enter Recovery Mode by following the procedure below:

1. Remove power from the MicroServer.
2. Open the unit by removing the chassis screws.
3. Locate the black shunts (jumpers) labeled J2 on the back of the circuit board (near the SD card).
4. Place a shunt on the BOOT pins.
5. Reapply power to the MicroServer.
6. Enter only the IP address of the MicroServer into a browser.
7. Follow the instructions on the screen by clicking “Perform Shutdown”, power the MicroServer down then remove the jumper.
8. Re-install the cover.
9. Apply power to the MicroServer and refresh your browser page.



10. Once in Recovery Mode follow the instructions above to restore the MicroServer to its original factory settings or contact Columbia Weather Systems for further support.



# SECTION 5: USER SUPPORT INFORMATION

This section consists of the following items:

1. **Two-Year Limited Warranty:** Please read this document carefully.
2. **Return for Repair Procedure:** This procedure is for your convenience in the event you must return your Weather MicroServer for repair or replacement. Follow the packing instructions carefully to protect your instrument in transit.

## Limited Warranty

Columbia Weather Systems, Inc. (CWS), warrants the Weather MicroServer to be free from defects in materials and/or workmanship when operated in accordance with the manufacturer's operating instructions, for one (1) years from date of purchase, subject to the provisions contained herein. CWS warranty shall extend to the original purchaser only and shall be limited to factory repair or replacement of defective parts.

## EXCLUSIONS

Certain parts are not manufactured by CWS (i.e., certain purchased options, etc.) and are therefore not covered by this warranty. These parts may be covered by warranties issued by their respective manufacturers and although CWS will not warrant these parts, CWS will act as agent for the administration of any such independent warranties during the term of this warranty. This warranty does not cover normal maintenance, damage resulting from improper use or repair, or abuse by the operator. Damage caused by lightning or other electrical discharge is specifically excluded. This warranty extends only to repair or replacement, and shall in no event extend to consequential damages. In the event of operator repair or replacement, this warranty shall cover neither the advisability of the repair undertaken, nor the sufficiency of the repair itself.

THIS DOCUMENT REFLECTS THE ENTIRE AND EXCLUSIVE UNDERSTANDING OF THE PARTIES, AND EXCEPT AS OTHERWISE PROVIDED HEREIN, ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, PARTICULARLY THE WARRANTIES OF MERCHANT ABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

## Return for Repair Procedure

1. In the event of defects or damage to your unit, first call the Service Department Monday through Friday, 8:30 am to 4:00 pm PST, (503) 629-0887 to determine the advisability of factory repair. The Service Department will issue an RMA number (Return Merchandise Authorization) to help us identify the package when received. Please place that number on the outside of the box.
2. In the event factory service is required, return your Weather MicroServer as follows:
  - A. Packing
    - ♦ Wrap the MicroServer in a plastic bag first.
    - ♦ Pack in original shipping carton or a sturdy oversized carton.
    - ♦ Use plenty of packing material.
  - B. Include:
    - ♦ A brief description of the problem with all known symptoms.
    - ♦ Your phone number.
    - ♦ Your return street shipping address (UPS will not deliver to a P.O. Box).
    - ♦ Write the RMA number on the outside of the box.
  - C. Shipping
    - ♦ Send freight prepaid (UPS recommended).
    - ♦ Insurance is recommended. (The factory can provide the current replacement value of the item being shipped for insurance purposes.)
  - D. Send to:

Columbia Weather Systems, Inc.  
5285 NE Elam Young Parkway, Suite C100  
Hillsboro, Oregon 97124
  - E. C.O.D. shipments will not be accepted.

3. If your unit is under warranty, after repair or replacement has been completed, it will be returned by a carrier and method chosen by Columbia Weather, Inc. to any destination within the continental U.S.A. If you desire some other specific form of conveyance or if you are located beyond these borders, then you must bear the additional cost of return shipment.
4. If your unit is not under warranty, we will call you with an estimate of the charges. If approved, your repaired unit will be returned after all charges, including parts, labor and return shipping and handling, have been paid. If not approved, your unit will be returned as is via UPS COD for the amount of the UPS COD freight charges.

# Appendix A

## Measurements Definition

### **Sample Timestamp**

Definition: Time and date of measurement

XML parameter: mtSampTime

### **Wind Speed**

Definition: 3 second rolling average of 250 millisecond samples

XML parameter: mtWindSpeed

Units: MPH

### **Raw Wind Direction**

Definition: 3 second rolling average of 250 millisecond samples

XML parameter: mtRawWindDir

Units: Degrees

### **Adjusted Wind Direction**

Definition: Raw wind direction corrected for North

XML parameter: mtAdjWindDir

Units: Degrees

### **3 Second Rolling Average Wind Speed**

Definition: 3 second rolling average of wind speed reading

XML parameter: mt3SecRollAvgWindSpeed

Units: MPH

### **3 Second Rolling Average Wind Direction**

Definition: 3 second rolling average of adjusted wind direction reading

XML parameter: mt3SecRollAvgWindDir

Units: Degrees

### **2 Minute Rolling Average Wind Speed**

Definition: 2 minute rolling average of wind speed reading

XML parameter: mt2MinRollAvgWindSpeed

Units: MPH

### **2 Minute Rolling Average Wind Direction**

Definition: 2 minute rolling average of adjusted wind direction reading

XML parameter: mt2MinRollAvgWindDir

Units: Degrees

---

**10 Minute Rolling Average Wind Speed**

Definition: 10 minute rolling average of wind speed reading

XML parameter: mt10MinRollAvgWindSpeed

Units: MPH

**10 Minute Rolling Average Wind Direction**

Definition: 10 minute rolling average of adjusted wind direction reading

XML parameter: mt10MinRollAvgWindDir

Units: Degrees

**10 Minute Gust Wind Direction**

Definition: 10 minute rolling wind direction at maximum wind speed.

XML parameter: mt10MinWindGustDir

Units: MPH

**10 Minute Gust Wind Speed**

Definition: 10 minute rolling maximum wind speed.

XML parameter: mt10MinWindGustSpeed

Units: MPH

**10 Minute Gust Time**

Definition: Gust time stamp during the last 10 minutes.

XML parameter: mt10MinWindGustTime

Units: date and time

**60 Minute Gust Wind Direction**

Definition: 60 minute rolling wind direction at maximum wind speed.

XML parameter: mt60MinWindGustDir

Units: MPH

**60 Minute Gust Wind Speed**

Definition: 60 minute rolling maximum wind speed.

XML parameter: mt60MinWindGustSpeed

Units: MPH

**60 Minute Gust Time**

Definition: Gust time stamp during the last 60 minutes.

XML parameter: mt60MinWindGustTime

Units: date and time

**60 Minute Rolling Average Wind Speed**

Definition: 60 minute rolling average of wind speed reading.

XML parameter: mt60MinRollAvgWindSpeed

Units: MPH

**60 Minute Rolling Average Wind Direction**

Definition: 60 minute rolling average of wind direction reading.

XML parameter: mt60MinRollAvgWindDir

Units: MPH

**2 Minute Gust Wind Direction**

Definition: 2 minute rolling wind direction at maximum wind speed.

XML parameter: mt2MinWindGustDir

Units: Degrees

**2 Minute Gust Wind Speed**

Definition: 2 minute rolling maximum wind speed.

XML parameter: mt2MinWindGustSpeed

Units: MPH

**2 Minute Gust Time**

Definition: Gust time stamp during the last 2 minutes.

XML parameter: mt2MinWindGustTime

Units: date and time

**Temperature 1**

Definition: Instantaneous temperature reading

XML parameter: mtTemp1

Units: °F

**Temperature 2**

Definition: Instantaneous temperature reading

XML parameter: mtTemp\_2

Units: °F

**Temperature 3**

Definition: Instantaneous temperature reading

XML parameter: mtTemp\_3

Units: °F

**Temperature 4**

Definition: Instantaneous temperature reading (Capricorn/Pegasus and MicroServer with additional analog channels only)

XML parameter: mtTemp\_4

Units: °F

**Relative Humidity**

Definition: One second relative humidity reading

XML parameter: mtRelHumidity

Units: %

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**Solar Radiation**

Definition: Instantaneous solar radiation reading

XML parameter: mtSolarRadiation

Units: W/m-2

**Wind Chill**

Definition: Calculated using temperature 1 and wind speed.

XML parameter: mtWindChill

Units: °F

**Heat Index**

Definition: Calculated using temperature 1 and relative humidity

XML parameter: mtHeatIndex

Units: °F

**Dew Point**

Definition: Calculated using temperature 1 and relative humidity

XML parameter: mtDewPoint

Units: °F

**Degree Days:**

Definition: Calculated using temperature 1

XML parameter: mtDegreeDay

Units: °F

**Average Temperature Today**

Definition: Calculated using temperature 1

XML parameter: mtAvgTempToday

Units: °F

**Degree Day Start**

Definition: Start date for degree day calculation

XML parameter: mtDegreeDayStart

**Raw Barometric Pressure**

Definition: One second barometric pressure reading

XML parameter: mtRawBaromPress

Units: Inches Hg

**Adjusted Barometric Pressure**

Definition: Raw barometric pressure with altitude and offset applied

XML parameter: mtAdjBaromPress

Units: Inches Hg

**Pressure Tendency**

Definition:



XML parameter: mtPressureTendency

Units: none

### **Density Altitude**

Definition: Calculated using adjusted barometric pressure, temperature 1, relative humidity and altitude.

XML parameter: mtDensityAltitude

Units: Feet

### **Wet Bulb Globe Temperature**

Definition: A composite temperature used to estimate the effect of temperature, humidity, and solar radiation on humans. The MicroServer uses an approximation formula.

XML parameter: mtWetBulbGlobeTemp

Units: °F

### **Wet Bulb Temperature**

Definition: Wet bulb temperature derived using a lookup table of temperature and relative humidity.

XML parameter: mtWetBulbTemp

Units: °F

### **Saturated Vapor Pressure**

Definition: The pressure of a vapor in equilibrium with its non-vapor phases when air is saturated with water vapor.

XML parameter: mtSaturatedVaporPressure

Units: Inches Hg

### **Vapor Pressure**

Definition: The pressure of a vapor in equilibrium with its non-vapor phases.

XML parameter: mtVaporPressure

Units: Inches Hg

### **Dry Air Pressure**

Definition: Barometric pressure minus vapor pressure.

XML parameter: mtDryAirPressure

Units: Inches Hg

### **Dry Air Density**

Definition: The air's density depending on temperature and pressure.

XML parameter: mtDryAirDensity

Units: lbm/ft3

### **Wet Air Density**

Definition: The air's density depending on temperature, humidity, and pressure.

XML parameter: mtWetAirDensity

Units: lbm/ft3

### **Absolute Humidity**

Definition: Actual amount of water vapor in the air.

XML parameter: mtAbsoluteHumidity

Units: lbm/ft3

### **Air Density Ratio**

Definition: Dry air density with the added effect of water vapor displacement of oxygen.

XML parameter: mtAirDensityRatio

Units: %

### **Adjusted Altitude**

Definition: Calculated using dry air density. Used for horsepower correction and prediction of vehicle performance.

XML parameter: mtAdjustedAltitude

Units: Feet

### **SAE Correction Factor**

Definition: Society of Automotive Engineers (SAE) calculation using temperature, pressure, and vapor pressure

XML parameter: mtSAECorrectionFactor

Units: none

### **Rain Today**

Definition: Accumulated rain for the day

XML parameter: mtRainToday

Units: Inches

### **Rain this week**

Definition: Accumulated rain for the week

XML parameter: mtRainThisWeek

Units: Inches

### **Rain this month**

Definition: Accumulated rain for the month

XML parameter: mtRainThisMonth

Units: Inches

### **Rain this year**

Definition: Accumulated rain for the year

XML parameter: mtRainThisYear

Units: Inches

**Rain Rate**

Definition: Running 5-minute rain rate

XML parameter: mtRainRate

Units: Inches/Hour

**Rain Last Hour**

Definition: Accumulated rain for the last hour

XML parameter: mtRainLastHr

Units: Inches/Hour

**Hail Today**

Definition: Cumulative amount of hits against collecting surface for the day (Orion Sensor only)

XML parameter: mtHailToday

Units: Hits/in<sup>2</sup>

**Hail Rate**

Definition: Running 5-minute hail rate (Orion Sensor only)

XML parameter: mtHailRate

Units: Hits/in<sup>2</sup>/hour

Units: km<sup>-1</sup>

**Visibility**

Definition: Visibility

XML parameter: mtVisibility

Units: miles

**Extinction Coefficient**

Definition: Fraction of light lost to scattering and absorption

XML parameter: mtExtinctionCoefficient

Units: km<sup>-1</sup>

**Lux**

Definition: Day/Night meter

XML parameter: mtLux

Units: Lux

**PAR**

Definition: PAR

XML parameter: mtPAR

Units:  $\mu\text{mol}/\text{m}^2/\text{s}$

**Particle Concentration**

Definition: Amount of particulate concentration

XML parameter: mtParticleConc

Units: mg/m<sup>3</sup>

---

**Wind Speed – Sensor 2**

Definition: 3 second rolling average of 250 millisecond samples

XML parameter: mtWindspeed\_2

Units: MPH

**Raw Wind Direction – Sensor 2**

Definition: 3 second rolling average of 250 millisecond samples

XML parameter: mtRawWindDir\_2

Units: Degrees

**Adjusted Wind Direction – Sensor 2**

Definition: Raw wind direction corrected for North

XML parameter: mtAdjWindDir\_2

Units: Degrees

**3 Second Rolling Average Wind Speed – Sensor 2**

Definition: 3 second rolling average of wind speed reading

XML parameter: mt3SecRollAvgWindSpeed\_2

Units: MPH

**3 Second Rolling Average Wind Direction – Sensor 2**

Definition: 3 second rolling average of adjusted wind direction reading

XML parameter: mt3SecRollAvgWindDir\_2

Units: Degrees

**2 Minute Rolling Average Wind Speed – Sensor 2**

Definition: 2 minute rolling average of wind speed reading

XML parameter: mt2MinRollAvgWindSpeed\_2

Units: MPH

**2 Minute Rolling Average Wind Direction – Sensor 2**

Definition: 2 minute rolling average of adjusted wind direction reading

XML parameter: mt2MinRollAvgWindDir\_2

Units: Degrees

**10 Minute Rolling Average Wind Speed – Sensor 2**

Definition: 10 minute rolling average of wind speed reading

XML parameter: mt10MinRollAvgWindSpeed\_2

Units: MPH

**10 Minute Rolling Average Wind Direction – Sensor 2**

Definition: 10 minute rolling average of adjusted wind direction reading

XML parameter: mt10MinRollAvgWindDir\_2

Units: Degrees

**10 Minute Gust Wind Direction – Sensor 2**

Definition: 10 minute rolling wind direction at maximum wind speed.

XML parameter: mt10MinWindGustDir\_2

Units: Degrees

### **10 Minute Gust Wind Speed – Sensor 2**

Definition: 10 minute rolling maximum wind speed.

XML parameter: mt10MinWindGustSpeed\_2

Units: MPH

### **10 Minute Gust Time – Sensor 2**

Definition: Gust time stamp during the last 10 minutes.

XML parameter: mt10MinWindGustTime\_2

Units: date and time

### **60 Minute Gust Wind Direction – Sensor 2**

Definition: 60 minute rolling wind direction at maximum wind speed.

XML parameter: mt60MinWindGustDir\_2

Units: Degrees

### **60 Minute Gust Wind Speed – Sensor 2**

Definition: 60 minute rolling maximum wind speed.

XML parameter: mt60MinWindGustSpeed\_2

Units: MPH

### **60 Minute Gust Time – Sensor 2**

Definition: Gust time stamp during the last 60 minutes.

XML parameter: mt60MinWindGustTime\_2

Units: date and time

### **60 Minute Rolling Average Wind Speed – Sensor 2**

Definition: 60 minute rolling average of wind speed reading.

XML parameter: mt60MinRollAvgWindSpeed

Units: MPH

### **60 Minute Rolling Average Wind Direction – Sensor 2**

Definition: 60 minute rolling average of wind direction reading.

XML parameter: mt60MinRollAvgWindDir

Units: Degrees

### **2 Minute Gust Wind Direction – Sensor 2**

Definition: 2 minute rolling wind direction at maximum wind speed.

XML parameter: mt2MinWindGustDir\_2

Units: Degrees

### **2 Minute Gust Wind Speed – Sensor 2**

Definition: 2 minute rolling maximum wind speed.

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XML parameter: mt2MinWindGustSpeed\_2

Units: MPH

**2 Minute Gust Time – Sensor 2**

Definition: Gust time stamp during the last 2 minutes.

XML parameter: mt2MinWindGustTime\_2

Units: date and time

# Appendix B

## Standard XML Web Server

The Weather MicroServer includes an XML Web Server available for other programs to access weather data.

The Standard XML page address is:

<http://192.168.0.50/latestsampledata.xml>

The field order in the XML file is based on the same order as the selected measurements in the Selected Measurements page.

With all the measurements selected, the XML file will be structured as follows:

```
<oriondata station="Hillsboro Orion">
<meas name="mtSampTime">2015/04/01 15:39:40</meas>
<meas name="mtTemp1">47.3</meas>
<meas name="mtWindChill">47.3</meas>
<meas name="mtHeatIndex">47.0</meas>
<meas name="mtDewPoint">39.5</meas>
<meas name="mtDegreeDay">1153.6</meas>
<meas name="mtDensityAltitude">-852</meas>
<meas name="mtAvgTempToday">41.8</meas>
<meas name="mtWetBulbGlobeTemp">53.6</meas>
<meas name="mtSaturatedVaporPressure">0.33</meas>
<meas name="mtVaporPressure">0.24</meas>
<meas name="mtDryAirPressure">29.85</meas>
<meas name="mtDryAirDensity">0.0781</meas>
<meas name="mtAbsoluteHumidity">0.0004</meas>
<meas name="mtAirDensityRatio">1</meas>
<meas name="mtAdjustedAltitude">-667</meas>
<meas name="mtSAECorrectionFactor">0.951843</meas>
<meas name="mtWetAirDensity">0.0785</meas>
<meas name="mtWetBulbTemp">42.6</meas>
<meas name="mtRelHumidity">74</meas>
```

---

```
<meas name="mtWindSpeed">1.8</meas>
<meas name="mtRawWindDir">264</meas>
<meas name="mtAdjWindDir">264</meas>
<meas name="mt3SecRollAvgWindSpeed">1.6</meas>
<meas name="mt3SecRollAvgWindDir">253</meas>
<meas name="mt2MinRollAvgWindSpeed">1.2</meas>
<meas name="mt2MinRollAvgWindDir">259</meas>
<meas name="mt10MinRollAvgWindSpeed">1.6</meas>
<meas name="mt10MinRollAvgWindDir">310</meas>
<meas name="mt60MinRollAvgWindSpeed">2.8</meas>
<meas name="mt60MinRollAvgWindDir">271</meas>
<meas name="mt60MinWindGustDir">196</meas>
<meas name="mt60MinWindGustSpeed">10.0</meas>
<meas name="mt60MinWindGustTime">2015/04/01 14:43:54</meas>
<meas name="mt10MinWindGustDir">342</meas>
<meas name="mt10MinWindGustSpeed">4.0</meas>
<meas name="mt10MinWindGustTime">2015/04/01 15:33:33</meas>
<meas name="mt2MinWindGustDir">245</meas>
<meas name="mt2MinWindGustSpeed">2.6</meas>
<meas name="mt2MinWindGustTime">2015/04/01 15:38:48</meas>
<meas name="mtRawBaromPress">30.09</meas>
<meas name="mtAdjBaromPress">30.31</meas>
<meas name="mtPressureTendency">0</meas>
<meas name="mtRainToday">0.0700</meas>
<meas name="mtRainThisWeek">0.2800</meas>
<meas name="mtRainThisMonth">0.0700</meas>
<meas name="mtRainThisYear">7.3900</meas>
<meas name="mtRainRate">0.0000</meas>
<meas name="mtRainLastHr">0.0100</meas>
<meas name="mtPrecipType">0.000000</meas>
<meas name="mtHailRate">0</meas>
<meas name="mtHailToday">0</meas>
```



</oriondata>

## Enhanced XML Web Server

The Enhanced XML page address is:

[http://192.168.0.50/tmp/latestsampledata\\_u.xml](http://192.168.0.50/tmp/latestsampledata_u.xml)

The field order in the XML file is based on the same order as the selected measurements in the Selected Measurements page.

The Enhanced XML file will be structured as follows:

```
<oriondata version="1.1" station="Hillsboro Orion">
<meas name="mtSampTime">2015/04/01 15:48:57</meas>
<meas name="mtTemp1" unit="degreeF">47.6</meas>
<meas name="mtWindChill" unit="degreeF">47.6</meas>
<meas name="mtHeatIndex" unit="degreeF">48.0</meas>
<meas name="mtDewPoint" unit="degreeF">39.4</meas>
<meas name="mtDegreeDay" unit="degreeF">1153.6</meas>
<meas name="mtDensityAltitude" unit="feetAlt">-820</meas>
<meas name="mtAvgTempToday" unit="degreeF">41.8</meas>
<meas name="mtWetBulbGlobeTemp" unit="degreeF">53.7</meas>
<meas name="mtSaturatedVaporPressure"
unit="inchesHg">0.33</meas>
<meas name="mtVaporPressure" unit="inchesHg">0.24</meas>
<meas name="mtDryAirPressure" unit="inchesHg">29.84</meas>
<meas name="mtDryAirDensity" unit="poundsPerFt3">0.0780</meas>
<meas name="mtAbsoluteHumidity"
unit="poundsPerFt3">0.0004</meas>
<meas name="mtAirDensityRatio" unit="percent">1</meas>
<meas name="mtAdjustedAltitude" unit="feetAlt">-640</meas>
<meas name="mtSAECorrectionFactor">0.952</meas>
<meas name="mtWetAirDensity" unit="poundsPerFt3">0.0784</meas>
<meas name="mtWetBulbTemp" unit="degreeF">42.5</meas>
<meas name="mtRelHumidity" unit="percent">73</meas>
<meas name="mtWindSpeed" unit="mph">1.7</meas>
```

---

```
<meas name="mtRawWindDir" unit="degrees">330</meas>
<meas name="mtAdjWindDir" unit="degrees">330</meas>
<meas name="mt3SecRollAvgWindSpeed" unit="mph">1.7</meas>
<meas name="mt3SecRollAvgWindDir" unit="degrees">326</meas>
<meas name="mt2MinRollAvgWindSpeed" unit="mph">2.3</meas>
<meas name="mt2MinRollAvgWindDir" unit="degrees">354</meas>
<meas name="mt10MinRollAvgWindSpeed" unit="mph">1.3</meas>
<meas name="mt10MinRollAvgWindDir" unit="degrees">304</meas>
<meas name="mt60MinRollAvgWindSpeed" unit="mph">2.4</meas>
<meas name="mt60MinRollAvgWindDir" unit="degrees">289</meas>
<meas name="mt60MinWindGustDir" unit="degrees">245</meas>
<meas name="mt60MinWindGustSpeed" unit="mph">9.5</meas>
<meas name="mt60MinWindGustTime">2015/04/01 14:51:57</meas>
<meas name="mt10MinWindGustDir" unit="degrees">351</meas>
<meas name="mt10MinWindGustSpeed" unit="mph">3.9</meas>
<meas name="mt10MinWindGustTime">2015/04/01 15:47:36</meas>
<meas name="mt2MinWindGustDir" unit="degrees">351</meas>
<meas name="mt2MinWindGustSpeed" unit="mph">3.9</meas>
<meas name="mt2MinWindGustTime">2015/04/01 15:47:36</meas>
<meas name="mtRawBaromPress" unit="inchesHg">30.08</meas>
<meas name="mtAdjBaromPress" unit="inchesHg">30.30</meas>
<meas name="mtPressureTendency" unit="unitless">0</meas>
<meas name="mtRainToday" unit="inchesRain">0.0700</meas>
<meas name="mtRainThisWeek" unit="inchesRain">0.2800</meas>
<meas name="mtRainThisMonth" unit="inchesRain">0.0700</meas>
<meas name="mtRainThisYear" unit="inchesRain">7.3900</meas>
<meas name="mtRainRate" unit="inchesPerHour">0.0000</meas>
<meas name="mtRainLastHr" unit="inchesPerHour">0.0100</meas>
<meas name="mtPrecipType">0.000000</meas>
<meas name="mtHailRate" unit="hitsPerInch2PerHour">0</meas>
<meas name="mtHailToday" unit="hitsPerInch2">0</meas>
</oriondata>
```

# Appendix C

## Modbus Point List

Weather MicroServer with Modbus TCP/IP Slave Interface or  
Modbus/RTU over COM2 (RS-485)

All measurements are in U.S. customary units.

## 32-Bit Registers

All data accessed via (read only) Input Registers

Data type Long = Signed 32 bit value

Data type Float = 32 bit floating point value

Node 1

For each available measurement, the two registers immediately following the value contain the most recently updated posix time value. For example: the Wind Speed value is stored in registers 5 and 6. The last updated timestamp is stored in registers 7 and 8 and is a 32-bit integer value.

Measurement	Description	Modbus Address
umtLastMeasTime	Time of last measurement	30001
	Last measurement time stamp	30003
umtWindSpeed	Wind speed	30005
	Wind speed time stamp	30007
umtRawWindDir	Wind direction - unadjusted	30009
	Wind direction - unadjusted time stamp	30011
umtAdjWindDir	Wind direction	30013
	Wind direction time stamp	30015
umtRelHumidity	Relative humidity	30017
	Relative humidity time stamp	30019
umtRawBaromPress	Barometric pressure - unadjusted	30021
	Barometric pressure -	30023

	unadjusted time stamp	
umtAdjBaromPress	Barometric pressure	30025
	Barometric pressure time stamp	30027
umtTrueNorthOffset	Electronics Compass wind direction offset	30029
	Electronics Compass wind direction offset time stamp	30031
umtLastRain	Last reported time of rainfall	30033
	Last reported time of rainfall time stamp	30035
umtTemp1	Air temperature	30037
	Air temperature time stamp	30039
umtWindChill	Wind chill	30041
	Wind chill time stamp	30043
umtHeatIndex	Heat index	30045
	Heat index time stamp	30047
umtDewPoint	Dew Point	30049
	Dew Point time stamp	30051
umtDensityAltitude	Density Altitude	30053
	Density Altitude time stamp	30055
umt3SecRollAvgWindSpeed	3-sec avg of wind speed	30057
	3-sec avg of wind speed time stamp	30059
umt3SecRollAvgWindDir	3-sec avg of wind direction	30061
	3-sec avg of wind direction time stamp	30063
umt2MinRollAvgWindSpeed	2-min avg of wind speed	30065
	2-min avg of wind speed time stamp	30067
umt2MinRollAvgWindDir	2-min avg of adjusted wind direction	30069
	2-min avg of adjusted wind direction time stamp	30071
umt10MinRollAvgWindSpeed	10-min avg of wind speed	30073
	10-min avg of wind	30075

	speed time stamp	
umt10MinRollAvgWindDir	10-min avg of adjusted wind direction	30077
	10-min avg of adjusted wind direction time stamp	30079
umt10MinWindGustDir	10-min wind direction at max wind speed	30081
	10-min wind direction at max wind speed time stamp	30083
umt10MinWindGustSpeed	10-min max wind speed	30085
	10-min max wind speed time stamp	30087
umt10MinWindGustTime	Time of 10-min max wind speed	30089
	Time of 10-min max wind speed time stamp	30091
umt60MinWindGustDir	60-min wind direction at max wind speed	30093
	60-min wind direction at max wind speed time stamp	30095
umt60MinWindGustSpeed	60-min max wind speed	30097
	60-min max wind speed time stamp	30099
umt60MinWindGustTime	Gust time stamp during the last 60 min	30101
	Gust time stamp during the last 60 min time stamp	30103
umtRainToday	Rain for the day	30105
	Rain for the day time stamp	30107
umtRainThisWeek	Rain for the week	30109
	Rain for the week time stamp	30111
umtRainThisMonth	Rain for the month	30113
	Rain for the month time stamp	30115
umtRainThisYear	Rain for the year	30117
	Rain for the year time stamp	30119
umtRainRate	Rain rate	30121
	Rain rate time stamp	30123

umtHailToday	Hail today	30125
	Hail today time stamp	30127
umtLastHail	Last hail	30129
	Last hail time stamp	30131
umtHailRate	Hail rate	30133
	Hail rate time stamp	30135
umtWetBulbGlobeTemp	Wet bulb globe temperature	30137
	Wet bulb globe temperature time stamp	30139
umtSaturatedVaporPressure	Saturated vapor pressure	30141
	Saturated vapor pressure time stamp	30143
umtVaporPressure	Vapor pressure	30145
	Vapor pressure time stamp	30147
umtDryAirPressure	Dry air pressure	30149
	Dry air pressure time stamp	30151
umtDryAirDensity	Dry air density	30153
	Dry air density time stamp	30155
umtAbsoluteHumidity	Absolute humidity	30157
	Absolute humidity time stamp	30159
umtAirDensityRatio	Air density ratio	30161
	Air density ratio time stamp	30163
umtAdjustedAltitude	Adjusted altitude	30165
	Adjusted altitude time stamp	30167
umtSAECorrectionFactor	SAE correction factor	30169
	SAE correction factor time stamp	30171
umtWetAirDensity	Wet air density	30173
	Wet air density time stamp	30175
umtWetBulbTemp	Wet bulb temperature	30177
	Wet bulb temperature time stamp	30179
umtExtinctionCoefficient	Visibility extinction coefficient	30181
	Visibility extinction	30183

	coefficient time stamp	
umtVisibility	Visibility in miles	30185
	Visibility time stamp	30187
umtLux	Visibility sensor light meter reading	30189
	Light meter reading time stamp	30191
umtDayNight	Visibility sensor day/night indicator	30193
	Day/Night indicator time stamp	30195
umtWindSpeed_2	Wind speed - 2nd sensor	30197
	Wind speed - 2nd sensor time stamp	30199
umtRawWindDir_2	Wind direction - 2nd sensor	30201
	Wind direction time stamp - 2nd sensor	30203
umt3SecRollAvgWindSpeed_2	3-sec avg of wind speed - 2nd sensor	30205
	3-sec avg of wind speed time stamp - 2nd sensor	30207
umt3SecRollAvgWindDir_2	3-sec avg of wind direction - 2nd sensor	30209
	3-sec avg of wind direction time stamp - 2nd sensor	30211
umt2MinRollAvgWindSpeed_2	2-min avg of wind speed - 2nd sensor	30213
	2-min avg of wind speed time stamp - 2nd sensor	30215
umt2MinRollAvgWindDir_2	2-min avg of wind direction - 2nd sensor	30217
	2-min avg of wind direction time stamp - 2nd sensor	30219
umt10MinRollAvgWindSpeed_2	10-min avg of wind speed - 2nd sensor	30221
	10-min avg of wind speed time stamp - 2nd sensor	30223
umt10MinRollAvgWindDir_2	10-min avg of wind direction - 2nd sensor	30225

	10-min avg of wind direction time stamp - 2nd sensor	30227
umt60MinWindGustDir_2	60-min wind direction at max wind speed - 2nd sensor	30229
	60-min wind direction at max wind speed time stamp - 2nd sensor	30231
umt60MinWindGustSpeed_2	60-min max wind speed - 2nd sensor	30233
	60-min max wind speed time stamp- 2nd sensor	30235
umt60MinWindGustTime_2	Gust time stamp during the last 60 min - 2nd sensor	30237
	Gust time stamp during the last 60 min time stamp - 2nd sensor	30239
umt10MinWindGustDir_2	10-min wind direction at max wind speed - 2nd sensor	30241
	10-min wind direction at max wind speed time stamp - 2nd sensor	30243
umt10MinWindGustSpeed_2	10-min max wind speed - 2nd sensor	30245
	10-min max wind speed time stamp- 2nd sensor	30247
umt10MinWindGustTime_2	Gust time stamp during the last 10 min - 2nd sensor	30249
	Gust time stamp during the last 10 min time stamp - 2nd sensor	30251
umtTemp2	Temperature 2	30253
	Temperature 2 time stamp	30255
umtTemp3	Temperature 3	30257
	Temperature 3 time stamp	30259
umtTemp4	Temperature 4	30261
	Temperature 4 time stamp	30263
umtSolarRadiation	Solar Radiation	30265
	Solar Radiation time	30267



	stamp	
umtSolarRadiation_2	Solar Radiation 2	30269
	Solar Radiation 2 time stamp	30271
umtSolarRadiation_3	Solar Radiation 3	30273
	Solar Radiation 3 time stamp	30275
umtSolarRadiation_4	Solar Radiation 4	30277
	Solar Radiation 4 time stamp	30279
umtRainLastHr	Rain Last Hour	30281
	Rain Last Hour time stamp	30283
umtRainLastHr_2	Rain Last Hour - 2nd sensor	30285
	Rain Last Hour time stamp - 2nd sensor	30287
umtRainToday_2	Rain for the day - 2nd sensor	30289
	Rain for the day time stamp - 2nd sensor	30291
umtRainThisWeek_2	Rain for the week - 2nd sensor	30293
	Rain for the week time stamp - 2nd sensor	30295
umtRainThisMonth_2	Rain for the month - 2nd sensor	30297
	Rain for the month time stamp - 2nd sensor	30299
umtRainThisYear_2	Rain for the year - 2nd sensor	30301
	Rain for the year time stamp - 2nd sensor	30303
umtRainRate_2	Rain rate - 2nd sensor	30305
	Rain rate time stamp - 2nd sensor	30307
umtPAR	PAR	30309
	PAR time stamp	30311
umtPAR_2	PAR - 2nd sensor	30313
	PAR time stamp - 2nd sensor	30315
umtRelHumidity_2	Relative Humidity - 2nd sensor	30317
	Relative Humidity time stamp - 2nd sensor	30319

umtRawBaromPress_2	Raw Barometric	
	Pressure - 2nd sensor	30321
	Raw barometric	
	Pressure time stamp -	
umtPrecipType	2nd sensor	30323
	Precipitation Type	30325
	Precipitation Type time	
	stamp	30327

A complete and updated Modbus Point List is also available from our website at:

<http://www.columbiaweather.com/resources/manuals-and-brochures/ms-docs/modbus-point-list.pdf>

## 16-Bit Registers

The 16-bit unsigned scaled integer registers

Data type: Unsigned scaled integers

Parameter value = (unsigned 16-bit integer + Offset)/Factor

Measurement	Description	Register	Factor	Offset
umtLastMeasTime		32001		
umtWindSpeed	Wind speed	32002	368	0
umtRawWindDir	Raw wind direction	32003	163	0
umtAdjWindDir	Adjusted wind direction	32004	163	0
umtRelHumidity	Relative humidity	32005	590	0
umtRawBaromPress	Raw barometric pressure	32006	2950	44250
umtAdjBaromPress,	Adjusted barometric pressure	32007	2950	44250
umtTrueNorthOffset		32008		
umtLastRain		32009		
umtTemp1	Temperature 1	32010	256	-17920
umtWindChill	Wind chill	32011	256	-17920
umtHeatIndex	Heat index	32012	256	-17920
umtDewPoint	Dew point	32013	256	-17920
umtDensityAltitude		32014		
umt3SecRollAvgWindSpeed	3-sec avg of wind speed	32015	368	0
umt3SecRollAvgWindDir	3-sec avg of wind direction	32016	163	0
umt2MinRollAvgWindSpeed	2-min avg of wind speed	32017	368	0
umt2MinRollAvgWindDir	2-min avg of adjusted wind direction	32018	163	0
umt10MinRollAvgWindSpeed	10-min avg of wind speed	32019	368	0
umt10MinRollAvgWindDir	10-min avg of adjusted wind direction	32020	163	0
umt10MinWindGustDir	10-min wind direction at max wind speed	32021	163	0
umt10MinWindGustSpeed	10-min max wind speed	32022	368	0

umt10MinWindGustTime		32023		
umt60MinWindGustDir	60-min wind direction at max wind speed	32024	163	0
umt60MinWindGustSpeed	60-min max wind speed	32025	368	0
umt60MinWindGustTime		32026		
umtRainToday	Rain for the day	32027	118	0
umtRainThisWeek	Rain for the week	32028	118	0
umtRainThisMonth	Rain for the month	32029	118	0
umtRainThisYear	Rain for the year	32030	118	0
umtRainRate	Rain rate	32031	2950	0
umtHailToday		32032		
umtLastHail		32033		
umtHailRate		32034		
umtWetBulbGlobeTemp	Wet bulb globe temperature	32035	256	-17920
umtSaturatedVaporPressure		32036		
umtVaporPressure		32037		
umtDryAirPressure		32038		
umtDryAirDensity		32039		
umtAbsoluteHumidity		32040		
umtAirDensityRatio		32041		
umtAdjustedAltitude		32042		
umtSAECorrectionFactor		32043		
umtWetAirDensity		32044		
umtWetBulbTemp	Wet bulb Temperature	32045	256	-17920
umtExtinctionCoefficient		32046		
umtVisibility		32047		
umtLux		32048		
umtDayNight		32049		
umtWindSpeed_2	Wind speed - 2nd sensor	32050	368	0
umtRawWindDir_2		32051	163	0
umt3SecRollAvgWindSpeed_2	3-sec avg of wind speed - 2nd sensor	32052	368	0
umt3SecRollAvgWindDir_2	3-sec avg of wind direction - 2nd sensor	32053	163	0
umt2MinRollAvgWindSpeed_2	2-min avg of wind speed - 2nd sensor	32054	368	0

umt2MinRollAvgWindDir_2	2-min avg of wind direction - 2nd sensor	32055	163	0
umt10MinRollAvgWindSpeed_2	10-min avg of wind speed - 2nd sensor	32056	368	0
umt10MinRollAvgWindDir_2	10-min avg of wind direction - 2nd sensor	32057	163	0
umt60MinWindGustDir_2	60-min wind direction at max wind speed - 2nd sensor	32058	163	0
umt60MinWindGustSpeed_2	60-min max wind speed - 2nd sensor	32059	368	0
umt60MinWindGustTime_2	Gust time stamp during the last 60 min - 2nd sensor	32060		
umt10MinWindGustDir_2	10-min wind direction at max wind speed - 2nd sensor	32061	163	0
umt10MinWindGustSpeed_2	10-min max wind speed - 2nd sensor	32062	368	0
umt10MinWindGustTime_2	Gust time stamp during the last 10 min - 2nd sensor	32063		
umtTemp2	Temperature 2	32064	256	-17920
umtTemp3	Temperature 3	32065	256	-17920
umtTemp4	Temperature 4	32066	256	-17920
umtSolarRadiation	Solar Radiation	32067	29	0
umtSolarRadiation_2	Solar Radiation 2	32068	29	0
umtSolarRadiation_3	Solar Radiation 3	32069	29	0
umtSolarRadiation_4	Solar Radiation 4	32070	29	0
umtRainLastHr	Rain Last Hour	32071	1475	0
umtRainLastHr_2	Rain Last Hour - 2nd sensor	2072	1475	0
umtRainToday_2	Rain for the day - 2nd sensor	2073	118	0
umtRainThisWeek_2	Rain for the week - 2nd sensor	2074	118	0
umtRainThisMonth_2	Rain for the month - 2nd sensor	2075	118	0

umtRainThisYear_2	Rain for the year - 2nd sensor	2076	118	0
umtRainRate_2	Rain rate - 2nd sensor	2077	2950	0
umtPAR	PAR	2078	19	0
umtPAR_2	PAR - 2nd sensor	2079	19	0
umtRelHumidity_2	Relative Humidity - 2nd sensor	2080	590	0
umtRawBaromPress_2	Raw Barometric Pressure - 2nd sensor	2081	2950	44250
umtPrecipType	Precipitation Type	2082	1	0

A complete and updated Modbus Point List is also available from our website at:

<http://www.columbiaweather.com/resources/manuals-and-brochures/ms-docs/modbus-point-list.pdf>

# Appendix D

## DNP3

Master address: 1-65535

Slave address: 1 - 65535

TCP port: 20000 (default)

Date type: Float

Client access: Read Only

Address: 30.5.X.Explicit, where X = the DNP3 index number

Measurement	Description	DNP3 index
umtLastMeasTime	Time of last measurement	1
umtWindSpeed	Wind speed	2
umtRawWindDir	Wind direction - unadjusted	3
umtAdjWindDir	Wind direction	4
umtRelHumidity	Relative humidity	5
umtRawBaromPress	Barometric pressure - unadjusted	6
umtAdjBaromPress	Barometric pressure	7
umtTrueNorthOffset	Electronics Compass wind direction offset	8
umtLastRain	Last reported time of rainfall	9
umtTemp1	Air temperature	10
umtWindChill	Wind chill	11
umtHeatIndex	Heat index	12
umtDewPoint	Dew Point	13
umtDensityAltitude	Density Altitude	14
umt3SecRollAvgWindSpeed	3-sec avg of wind speed	15
umt3SecRollAvgWindDir	3-sec avg of wind direction	16
umt2MinRollAvgWindSpeed	2-min avg of wind speed	17
umt2MinRollAvgWindDir	2-min avg of adjusted wind direction	18
	2-min avg of adjusted wind direction time stamp	
umt10MinRollAvgWindSpeed	10-min avg of wind speed	19
	10-min avg of wind speed time stamp	
umt10MinRollAvgWindDir	10-min avg of adjusted wind direction	20
umt10MinWindGustDir	10-min wind direction at	21

	max wind speed	
umt10MinWindGustSpeed	10-min max wind speed	22
umt10MinWindGustTime	Time of 10-min max wind speed	23
umt60MinWindGustDir	60-min wind direction at max wind speed	24
umt60MinWindGustSpeed	60-min max wind speed	25
umt60MinWindGustTime	Gust time stamp during the last 60 min	26
umtRainToday	Rain for the day	27
umtRainThisWeek	Rain for the week	28
umtRainThisMonth	Rain for the month	29
umtRainThisYear	Rain for the year	30
umtRainRate	Rain rate	31
umtHailToday	Hail today	32
umtLastHail	Last hail	33
umtHailRate	Hail rate	34
umtWetBulbGlobeTemp	Wet bulb globe temperature	35
umtSaturatedVaporPressure	Saturated vapor pressure	36
umtVaporPressure	Vapor pressure	37
umtDryAirPressure	Dry air pressure	38
umtDryAirDensity	Dry air density	39
umtAbsoluteHumidity	Absolute humidity	40
umtAirDensityRatio	Air density ratio	41
umtAdjustedAltitude	Adjusted altitude	42
umtSAECorrectionFactor	SAE correction factor	43
umtWetAirDensity	Wet air density	44
umtWetBulbTemp	Wet bulb temperature	45
umtExtinctionCoefficient	Visibility extinction coefficient	46
umtVisibility	Visibility in miles	47
umtLux	Visibility sensor light meter reading	48
umtDayNight	Visibility sensor day/night indicator	49
umtWindSpeed_2	Wind speed - 2nd sensor	50
umtRawWindDir_2	Wind direction - 2nd sensor	51
umt3SecRollAvgWindSpeed_2	3-sec avg of wind speed - 2nd sensor	52
umt3SecRollAvgWindDir_2	3-sec avg of wind direction - 2nd sensor	53
umt2MinRollAvgWindSpeed_2	2-min avg of wind speed - 2nd sensor	54



umt2MinRollAvgWindDir_2	2-min avg of wind direction - 2nd sensor	55
umt10MinRollAvgWindSpeed_2	10-min avg of wind speed - 2nd sensor	56
umt10MinRollAvgWindDir_2	10-min avg of wind direction - 2nd sensor	57
umt60MinWindGustDir_2	60-min wind direction at max wind speed - 2nd sensor	58
umt60MinWindGustSpeed_2	60-min max wind speed - 2nd sensor	59
umt60MinWindGustTime_2	Gust time stamp during the last 60 min - 2nd sensor	60
umt10MinWindGustDir_2	10-min wind direction at max wind speed - 2nd sensor	61
umt10MinWindGustSpeed_2	10-min max wind speed - 2nd sensor	62
umt10MinWindGustTime_2	Gust time stamp during the last 10 min - 2nd sensor	63
umtTemp2	Temperature 2	64
umtTemp3	Temperature 3	65
umtTemp4	Temperature 4	66
umtSolarRadiation	Solar Radiation	67
umtSolarRadiation_2	Solar Radiation 2	68
umtSolarRadiation_3	Solar Radiation 3	69
umtSolarRadiation_4	Solar Radiation 4	70
umtRainLastHr	Rain Last Hour	71
umtRainLastHr_2	Rain Last Hour - 2nd sensor	72
umtRainToday_2	Rain for the day - 2nd sensor	73
umtRainThisWeek_2	Rain for the week - 2nd sensor	74
umtRainThisMonth_2	Rain for the month - 2nd sensor	75
umtRainThisYear_2	Rain for the year - 2nd sensor	76
umtRainRate_2	Rain rate - 2nd sensor	77
umtPAR	PAR	78
umtPAR_2	PAR - 2nd sensor	79
umtRelHumidity_2	Relative Humidity - 2nd sensor	80
umtRawBaromPress_2	Raw Barometric Pressure - 2nd sensor	81
umtPrecipType	Precipitation Type	82

umtPressureTendency	Pressure Tendency	83
umtSnowDepth	Snow Depth	84
umtEvapotranspiration	Evapotranspiration	85
umt2MinWindGustDir	2-min wind direction at max wind speed	86
umt2MinWindGustSpeed	2-min max wind speed	87
umt2MinWindGustTime	Gust time stamp during the last 2 min	88
umt2MinWindGustDir_2	2-min wind direction at max wind speed - 2nd sensor	89
umt2MinWindGustSpeed_2	2-min max wind speed - 2nd sensor	90
umt2MinWindGustTime_2	Gust time stamp during the last 2 min - 2nd sensor	91

A complete and updated point list is available at:

<http://www.columbiaweather.com/resources/manuals-and-brochures/ms-docs/dnp3-parameter-index-list.pdf>

# Appendix E

## BACnet

Device ID: 1 to 4194304

UDP Port: 47808

Measurement	Description	BACnet index
umtLastMeasTime	Time of last measurement	1
umtWindSpeed	Wind speed	2
umtRawWindDir	Wind direction - unadjusted	3
umtAdjWindDir	Wind direction	4
umtRelHumidity	Relative humidity	5
umtRawBaromPress	Barometric pressure - unadjusted	6
umtAdjBaromPress	Barometric pressure	7
umtTrueNorthOffset	Electronics Compass wind direction offset	8
umtLastRain	Last reported time of rainfall	9
umtTemp1	Air temperature	10
umtWindChill	Wind chill	11
umtHeatIndex	Heat index	12
umtDewPoint	Dew Point	13
umtDensityAltitude	Density Altitude	14
umt3SecRollAvgWindSpeed	3-sec avg of wind speed	15
umt3SecRollAvgWindDir	3-sec avg of wind direction	16
umt2MinRollAvgWindSpeed	2-min avg of wind speed	17
umt2MinRollAvgWindDir	2-min avg of adjusted wind direction	18
umt10MinRollAvgWindSpeed	10-min avg of wind speed	19
umt10MinRollAvgWindDir	10-min avg of adjusted wind direction	20
umt10MinWindGustDir	10-min wind direction at max wind speed	21
umt10MinWindGustSpeed	10-min max wind speed	22
umt10MinWindGustTime	Time of 10-min max wind speed	23
umt60MinWindGustDir	60-min wind direction at max wind speed	24
umt60MinWindGustSpeed	60-min max wind speed	25
umt60MinWindGustTime	Gust time stamp during the	26

	last 60 min	
umtRainToday	Rain for the day	27
umtRainThisWeek	Rain for the week	28
umtRainThisMonth	Rain for the month	29
umtRainThisYear	Rain for the year	30
umtRainRate	Rain rate	31
umtHailToday	Hail today	32
umtLastHail	Last hail	33
umtHailRate	Hail rate	34
umtWetBulbGlobeTemp	Wet bulb globe temperature	35
umtSaturatedVaporPressure	Saturated vapor pressure	36
umtVaporPressure	Vapor pressure	37
umtDryAirPressure	Dry air pressure	38
umtDryAirDensity	Dry air density	39
umtAbsoluteHumidity	Absolute humidity	40
umtAirDensityRatio	Air density ratio	41
umtAdjustedAltitude	Adjusted altitude	42
umtSAECorrectionFactor	SAE correction factor	43
umtWetAirDensity	Wet air density	44
umtWetBulbTemp	Wet bulb temperature	45
umtExtinctionCoefficient	Visibility extinction coefficient	46
umtVisibility	Visibility in miles	47
umtLux	Visibility sensor light meter reading	48
umtDayNight	Visibility sensor day/night indicator	49
umtWindSpeed_2	Wind speed - 2nd sensor	50
umtRawWindDir_2	Wind direction - 2nd sensor	51
umt3SecRollAvgWindSpeed_2	3-sec avg of wind speed - 2nd sensor	52
umt3SecRollAvgWindDir_2	3-sec avg of wind direction - 2nd sensor	53
umt2MinRollAvgWindSpeed_2	2-min avg of wind speed - 2nd sensor	54
umt2MinRollAvgWindDir_2	2-min avg of wind direction - 2nd sensor	55
umt10MinRollAvgWindSpeed_2	10-min avg of wind speed - 2nd sensor	56
umt10MinRollAvgWindDir_2	10-min avg of wind direction - 2nd sensor	57
umt60MinWindGustDir_2	60-min wind direction at	58

	max wind speed - 2nd sensor	
umt60MinWindGustSpeed_2	60-min max wind speed - 2nd sensor	59
umt60MinWindGustTime_2	Gust time stamp during the last 60 min - 2nd sensor	60
umt10MinWindGustDir_2	10-min wind direction at max wind speed - 2nd sensor	61
umt10MinWindGustSpeed_2	10-min max wind speed - 2nd sensor	62
umt10MinWindGustTime_2	Gust time stamp during the last 10 min - 2nd sensor	63
umtTemp2	Temperature 2	64
umtTemp3	Temperature 3	65
umtTemp4	Temperature 4	66
umtSolarRadiation	Solar Radiation	67
umtSolarRadiation_2	Solar Radiation 2	68
umtSolarRadiation_3	Solar Radiation 3	69
umtSolarRadiation_4	Solar Radiation 4	70
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A complete and updated DNP3 Index List is also available from our website at:

<http://www.columbiaweather.com/resources/manuals-and-brochures/ms-docs/bacnet-parameters.pdf>

# Reference

## Glossary

### **Aspirating Radiation Shield**

A device used to shield a sensor such as a temperature probe from direct and indirect radiation and rain while providing access for ventilation.

### **Barometric Pressure**

The pressure exerted by the atmosphere as a consequence of gravitational attraction exerted upon the “column” of air lying directly above the point in question.

### **Celsius Temperature Scale**

A temperature scale with the ice point at 0 degrees and the boiling point of water at 100 degrees.

### **Dew Point**

The temperature to which a given parcel of air must be cooled at constant pressure and constant water-vapor content in order for saturation to occur. When this temperature is below 0 °C, it is sometimes called the frost point.

### **Density Altitude**

Density altitude is a meteorological variable that is important to pilots, especially during the summer. The density altitude is the altitude in a standard atmosphere where the density is the same as the given atmospheric density. During a hot muggy summer day, a pilot begins take off from an airport with an elevation of 2500 feet. Because of the warm temperature and the moisture in the air, the airplane has to work as if it was taking off at an airport at an elevation of 6000 feet resulting in the plane needing more power and a longer roll down the runway to take off.

### **Fahrenheit Temperature Scale**

A temperature scale with the ice point at 32 degrees and the boiling point of water at 212 degrees.

## Global Radiation

The total of direct solar radiation and diffused sky radiation received by a unit horizontal surface. Global radiation is measured by a Pyranometer.

## Heat Index

The heat index or apparent temperature is a measure of discomfort due to the combination of heat and high humidity. It was developed in 1979 and is based on studies of evaporative skin cooling for combinations of temperature and humidity.

## Pyranometer

Measures the combined intensity of incoming direct solar radiation and diffused sky radiation. The Pyranometer consists of a radiation-sensing element, which is mounted so that it views the entire sky.

## Relative Humidity

Popularly called humidity. The ratio of the actual vapor pressure of the air to the saturation vapor pressure.

## Sea Level Pressure

The atmospheric pressure at mean sea level, either directly measured or, most commonly, empirically determined from the observed station pressure.

In regions where the earth's surface pressure is above sea level, it is standard observational practice to reduce the observed surface pressure to the value that would exist at a point at sea level directly below.

## Solar Radiation

The total electromagnetic radiation emitted by the sun. 99% of the sun's energy output falls within the wavelength interval from 0.15 microns to 4.0 microns, with peak intensity near 0.47 microns. About one-half of the total energy in the solar beam is contained within the visible spectrum from 0.4 to 0.7 microns, and most of the other half lies near infrared, a small additional portion lying in the ultraviolet.

## Wind Chill

That part of the total cooling of a body caused by air motion.



## Unit Conversion

### Speed

Kilometers per hour = 1.610 x miles per hour

Knots = 0.869 x miles per hour

Meters per second = 0.448 x miles per hour

Feet per second = 1.467 x miles per hour

### Temperature

Temperature in °C = 5/9 (temperature in °F - 32)

Temperature in °F = (1.8 x temperature in °C) + 32

### Distance

Millimeters = 25.4 x inches

### Pressure

Millibars = 33.86 x inches of mercury

Kilopascals = 3.386 x inches of mercury

Pounds per square inch = 0.49 x inches of mercury

Standard atmospheres = 0.0334 x inches of mercury

### Solar Radiation

BTU/foot<sup>2</sup> minutes = 0.00529 x watts/meter<sup>2</sup>

Joules/centimeter<sup>2</sup> minutes = 0.006 x watts/meter<sup>2</sup>

Mega joules/meter<sup>2</sup> day = 11.574 x watts/meter<sup>2</sup>

Langleys/minutes = 0.00143 x watts/meter<sup>2</sup>

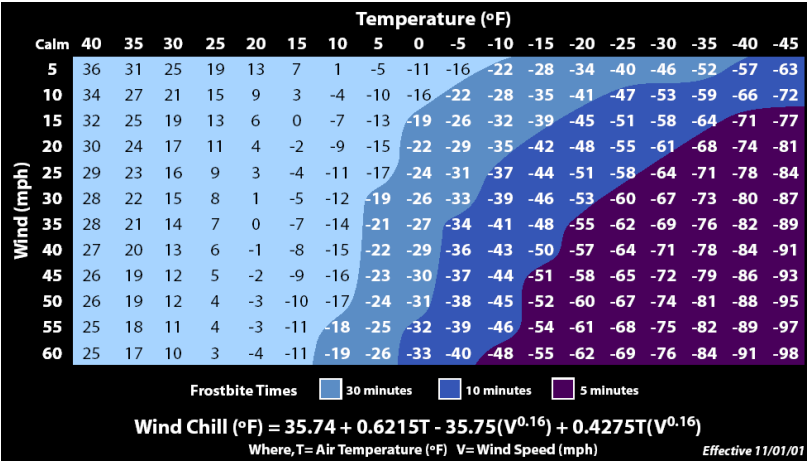
# Tables and Formulas

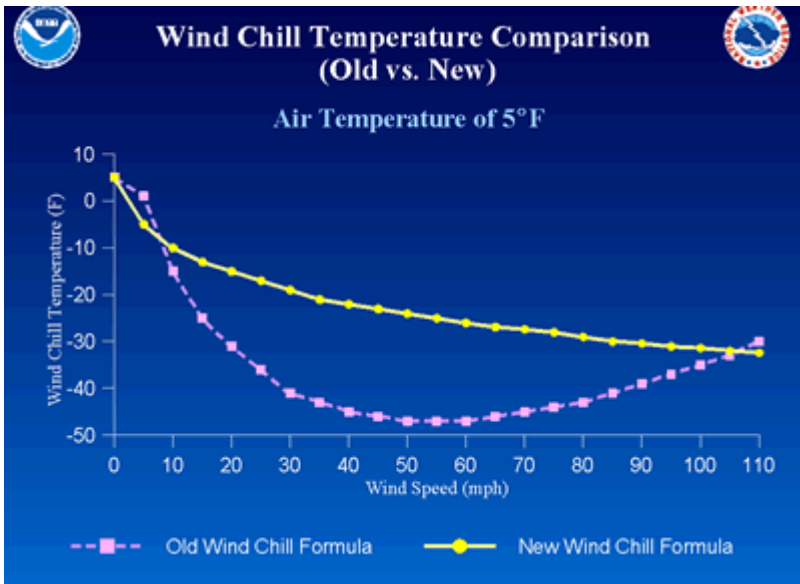
## Wind Chill Chart

In 2001, NWS implemented an updated Wind chill Temperature (WCT) index. The change improves upon the former WCT Index used by the NWS and the Meteorological Services of Canada, which was based on the 1945 Siple and Passel Index.

In the fall of 2000, the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) formed a group consisting of several Federal agencies, MSC, the academic community (Indiana University-Purdue University in Indianapolis (IUPUI), University of Delaware and University of Missouri), and the International Society of Biometeorology to evaluate and improve the wind chill formula. The group, chaired by the NWS, is called the Joint Action Group for temperature Indices (JAG/TI). JAG/TI's goal is to upgrade and standardize the index for temperature extremes internationally (e.g. Wind chill Index).

The current formula uses advances in science, technology, and computer modeling to provide a more accurate, understandable, and useful formula for calculating the dangers from winter winds and freezing temperatures.





## Wind Chill Equation

$$WC = 35.74 + 0.6215 T - 35.75(V^{0.16}) + 0.4275 T(V^{0.16})$$

Where:

WC = wind chill temperature in °F

V = wind velocity in mph

T = air temperature in °F

**Note:** Wind chill Temperature is only defined for temperatures at or below 50 degrees F and wind speeds above 3 mph.

Heat Index

	Temperature in °F														
RH	70	75	80	85	90	95	100	105	110	115	120	125	130	135	
0	64	66	73	78	83	87	91	95	99	103	107	111	117	120	
5	64	69	74	79	84	88	93	97	102	107	111	116	122	126	
10	65	70	75	80	85	90	95	100	105	111	116	123	131		
15	65	71	76	81	86	91	97	102	108	115	123	131			
20	66	72	77	82	87	93	99	105	112	120	130	141			
25	66	72	77	83	88	94	101	109	117	127	139				
30	67	73	78	84	90	96	104	113	123	135	148				
35	67	73	79	85	91	98	107	118	130	143					
40	68	74	79	86	93	101	110	123	137	151					
45	68	74	80	87	95	104	115	129	143						
50	69	75	81	88	96	107	120	135	150						
55	69	75	81	89	98	110	126	142							
60	70	76	82	90	100	114	132	149							
65	70	76	83	91	102	119	138								
70	70	77	84	93	106	124	144								
75	70	77	85	95	109	130	150								
80	71	78	86	97	113	136									
85	71	78	87	99	117	140									
90	71	79	88	102	122	150									
95	71	79	89	105	126										
100	72	80	90	108	131										

## Dew Point

$$B = (\ln (RH/100) + ((17.2694 * T) / (238.3 + T))) / 17.2694$$

$$\text{Dew Point in } ^\circ\text{C} = (238.3 * B) / (1 - B)$$

Where:

RH = Relative Humidity

T = Temperature in  $^\circ\text{C}$

Ln = Natural logarithm



Columbia Weather Systems, Inc.  
5285 NE Elam Young Parkway, Suite C100  
Hillsboro, OR 97124

**Telephone**

(503) 629-0887

**Fax**

(503) 629-0898

**Web Site**

<http://www.columbiaweather.com>

**Email**

[info@columbiaweather.com](mailto:info@columbiaweather.com)

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